



# **NAVAL POSTGRADUATE SCHOOL**

**MONTEREY, CALIFORNIA**

## **THESIS**

**A COMPARATIVE ANALYSIS OF TWO PERIODS OF  
SUSTAINED BUDGET GROWTH AND AN INTERCEDING  
PERIOD OF BUDGET DECLINE FOR THE DEPARTMENT  
OF THE NAVY**

by

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December 2010

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DEPARTMENT OF THE NAVY**

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## **ABSTRACT**

Since 1998, the defense budget has risen steadily but force structure has not. There are fewer ships, aircraft and personnel in the Department of the Navy (DoN) today despite nearly 42% budget growth. This differs markedly from the periods of growth during the late 1970s and early 1980s when force structure increased along with increased Navy budgets.

Over the years, plenty of attention has been paid to how much the Department of Defense spends annually in budget allocations and force structure. However, very little attention has been given to the area of increasing budgets with decreasing force structure. One barrier to such an investigation of increasing budgets and decreasing force structures is a consistent method by which analysts and policy makers may compare budget and force structure changes (growth and decline) longitudinally. This study introduces a baseline of historical and contextual information for defense leaders who are concerned about a likely decline in their budget. This study also introduces an analysis and comparison of budget and force structure data over time to assist policy makers in their analysis and decision-making process when evaluating and developing budgets.

The purpose of this project is to conduct a comparative analysis of the last two periods of sustained budget growth and its interceding period of decline for the Department of the Navy, describe corresponding changes in force structure, and propose possible explanations. Finally, this paper provides specific recommendations for areas of future research.

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## TABLE OF CONTENTS

<b>I.</b>	<b>INTRODUCTION.....</b>	<b>1</b>
<b>A.</b>	<b>BACKGROUND .....</b>	<b>1</b>
<b>B.</b>	<b>LITERATURE REVIEW .....</b>	<b>3</b>
<b>C.</b>	<b>THE RESEARCH QUESTION.....</b>	<b>7</b>
1.	Primary Research Questions .....	7
2.	Secondary Research Questions.....	7
<b>D.</b>	<b>SCOPE, LIMITATIONS, AND ASSUMPTIONS .....</b>	<b>8</b>
<b>E.</b>	<b>ORGANIZATION OF STUDY .....</b>	<b>8</b>
<b>II.</b>	<b>BACKGROUND .....</b>	<b>9</b>
<b>A.</b>	<b>UNDERSTANDING THE NATIONAL DEFENSE BUDGET.....</b>	<b>12</b>
<b>B.</b>	<b>UNDERSTANDING NAVY’S BUDGET AND APPROPRIATIONS .....</b>	<b>14</b>
<b>C.</b>	<b>UNDERSTANDING FORCE STRUCTURE.....</b>	<b>18</b>
<b>III.</b>	<b>METHODOLOGY .....</b>	<b>21</b>
<b>A.</b>	<b>ANSWERING THE RESEARCH QUESTION.....</b>	<b>21</b>
1.	Source of Data .....	21
2.	Organization of Data .....	22
3.	Presentation of Data .....	23
<b>IV.</b>	<b>BUDGET AUTHORITY AND APPROPRIATIONS .....</b>	<b>25</b>
<b>A.</b>	<b>ANALYSIS OF DoD AND DoN BUDGET AUTHORITY.....</b>	<b>25</b>
<b>B.</b>	<b>DoN BUDGET AUTHORITY BY APPROPRIATION TITLE.....</b>	<b>27</b>
1.	Analysis of DoN B/A by Appropriation Title .....	28
2.	Analysis of DoN B/A Distribution by Appropriation Title .....	30
<b>V.</b>	<b>PERSONNEL .....</b>	<b>33</b>
<b>A.</b>	<b>STRUCTURE OF DoN MILITARY AND CIVILIAN PERSONNEL.....</b>	<b>33</b>
1.	Analysis of DoN Officer and Enlisted Force Structure .....	34
2.	Analysis of DoN Civilian Structure .....	36
<b>B.</b>	<b>ALLOCATION OF MILPERS AND O&amp;M SPENDING FOR PERSONNEL .....</b>	<b>38</b>
1.	Analysis of MILPERS and O&M.....	39
<b>C.</b>	<b>DoN SPENDING PER CAPITA.....</b>	<b>41</b>
1.	Navy and Marine Corps Only Per Capita Spending .....	42
2.	DoN Civilian Only Per Capita Spending .....	44
<b>VI.</b>	<b>SHIPS AND AIRCRAFT .....</b>	<b>47</b>
<b>A.</b>	<b>STRUCTURE OF DoN SHIPS.....</b>	<b>47</b>
1.	Analysis of DoN B/A, SCN and Total # of Naval Ships (1975– 2010) .....	48
2.	Analysis of Naval Ship Distribution (1975–2010) .....	50
<b>B.</b>	<b>STRUCTURE OF DoN AIRCRAFT .....</b>	<b>53</b>
1.	Analysis of DoN B/A, APN and Total # of Naval A/C (1975– 2010) .....	54

2.	Analysis of Naval Aircraft Distribution (1975–2010) .....	55
VII.	CONCLUSION AND RECOMMENDATIONS.....	59
A.	COMPARATIVE ANALYSIS OF PERIODS OF SUSTAINED GROWTH AND DECLINE.....	59
B.	RECOMMENDATIONS.....	64
	APPENDIX. DEFINITIONS .....	67
	LIST OF REFERENCES .....	71
	INITIAL DISTRIBUTION LIST .....	73



## LIST OF FIGURES

Figure 1.	DoD and DoN Total B/A (From Comptroller, 2010) .....	2
Figure 2.	DoN B/A by Appropriation (From Comptroller, 2010).....	17
Figure 3.	DoD Appropriation Distribution (From Comptroller, 2010).....	18
Figure 4.	DoD and DoN Total B/A (From Comptroller, 2010) .....	26
Figure 5.	DoN Budget Authority by Appropriation Title (From Comptroller, 2010).....	28
Figure 6.	DoN B/A Distribution by Appropriation Title (From Comptroller, 2010).....	30
Figure 7.	Total DoN Officer and Enlisted Personnel (From Federal Budget 1975– 2010) .....	34
Figure 8.	Uniformed and Civilian Personnel in DoN (From Comptroller, 2010).....	36
Figure 9.	DoD Civilian Pay (1975–2010) (From Comptroller, 2010) .....	38
Figure 10.	DoN Personnel vs. MILPERS / O&M Appropriations (From Comptroller, 2010) .....	39
Figure 11.	DoN B/A vs. SCN vs. # of Ships (From Comptroller 2010; Federal Budget 1975–2010; Naval Historical Center, 2010) .....	48
Figure 12.	Number of Ships by Category (From Naval Historical Center, 2010) .....	51
Figure 13.	Naval Ship Distribution (From Naval Historical Center, 2010).....	52
Figure 14.	DoN B/A vs. APN vs. # of A/C .....	54
Figure 15.	Number of A/C by Category .....	56

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## LIST OF TABLES

Table 1.	DoD and DoN Total Budget Authority (From Comptroller, 2010).....	13
Table 2.	Real Change in Total Budget Authority (From Comptroller, 2010) .....	27
Table 3.	DoN B/A by Appropriation Title.....	29
Table 4.	Real Growth DoN B/A by Appropriation Title (From Comptroller, 2010) ....	29
Table 5.	Average Percentage of DoN B/A (From Comptroller, 2010).....	31
Table 6.	DoD and DoN Officers and Enlisted Gains and Losses (From Federal Budget 1975–2010).....	35
Table 7.	Personnel and Appropriation Real Change (From Comptroller, 2010).....	41
Table 8.	Per Capita Changes (From Comptroller, 2010) .....	43
Table 9.	Actual Number of Ships Per Category.....	51
Table 10.	Real Growth in # of Ships by Category and SCN (From Federal Budget 1975–2010, Naval Historical Center) .....	52
Table 11.	Actual Number of A/C Per Category.....	56
Table 12.	Real Growth in # of A/C by Category and APN .....	57

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## **LIST OF ACRONYMS AND ABBREVIATIONS**

APN	Aviation Procurement, Navy
B/A	Budget Authority
BES	Budget Estimate Submission
CBO	Congressional Budget Office
CJCS	Chairman of the Joint Chiefs of Staff
COCOM	Combatant Commander
CPA	Chairman's Program Assessment
CRS	Congressional Research Service
CY2010\$	Constant Year 2010 Dollars
DAU	Defense Acquisition University
DEPSECDEF	Deputy Secretary of Defense
DoD	Department of Defense
DoN	Department of the Navy
FTE	Full Time Equivalent
FY	Fiscal Year
GAO	Government Accounting Office
GDP	Gross Domestic Product
JCS	Joint Chiefs of Staff
MILCON	Military Construction
MILPERS	Military Personnel
NDS	National Defense Strategy
NMS	National Military Strategy
NSS	National Security Strategy
O&M	Operations and Maintenance
OMB	Office of Management and Budget
OSD	Office of the Secretary of Defense
PB	President's Budget
POM	Program Objective Memorandum
PPBE	Planning, Programming, Budgeting, and Execution
QDR	Quadrennial Defense Review

RDT&E	Research, Development, Testing and Evaluation
SCN	Shipbuilding Conversion, Navy
SECDEF	Secretary of Defense
USD (C)	Under Secretary of Defense (Comptroller)

## **I. INTRODUCTION**

### **A. BACKGROUND**

On August 9, 2010, Secretary of Defense (SECDEF) Robert Gates announced that the Department of Defense (DoD) would spend \$100 billion less on overhead in the next five years. The goal was not to reduce the DoD top line, but to reduce excess overhead costs and apply savings to force structure and modernization. According to Secretary Gates, while the U.S. faces significant economic challenges and growing budget deficits, defense base funding must sustain its growth to maintain its force structure and modernization, and it will require a 2–3% real growth in the DoD’s defense budget. The current and future defense budgets project a steady, modest growth of only 1% per year, and this initiative will make up the difference.

Since 1998, the DoD budget has grown by 73% in constant 2010 dollars (CY2010\$), but its force structure has not. Specifically, there are fewer ships, submarines, aircraft, and personnel in the Department of the Navy (DoN) today, despite the budget growth. This differs markedly from the period of growth during the late 1970s and early 1980s, when force structure increased along with defense budgets.

The defense budget top line has followed a cyclical pattern since WWII. The concern of senior defense officials is that the budget—currently above the peak of the last cycle—will soon fall, and the nation’s investment in defense will result in a lesser force structure.

Figure 1 displays the real growth in DoD and DoN’s budget authority since 1975 in inflation-adjusted dollars.

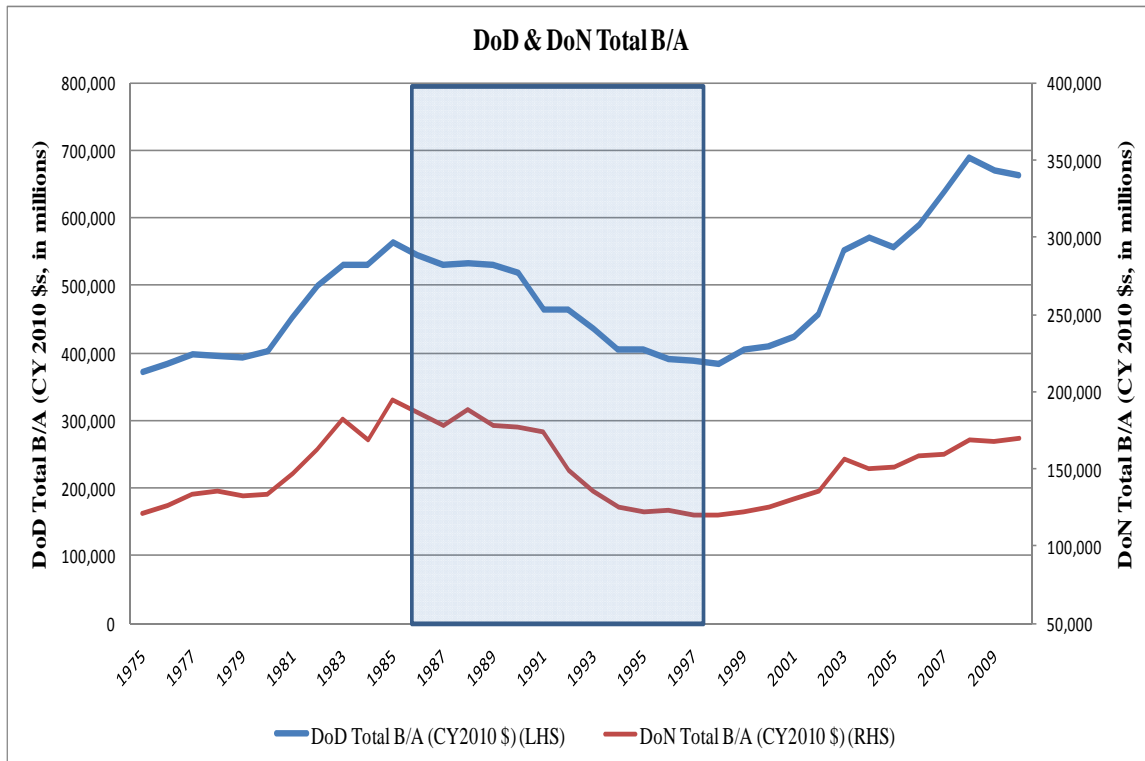


Figure 1. DoD and DoN Total B/A (From Comptroller, 2010)

Based on the peaks and troughs of the DoD's and DoN's budget authority (B/A) over the past 35 years, periods of sustained growth occurred from 1975–1985 and 1998–2010. During the intervening period, 1985–1998, defense budgets fell.

The purpose of this project is to analyze the changes in the budget authority for the DoD and the DoN, and determine how they have affected the force structure composition over the last two periods of sustained budget growth and the interceding period of decline. The project will illustrate changes in force structure and propose possible explanations for these changes. The analysis of these three periods will answer the following research questions:

- What insights can a comparative analysis of two periods of sustained budget growth and an interceding period of budget decline for the DoN provide?
- What were the changes in the DoN's budget allocations, and what were their effects on force structure?



The goal of this study is to establish a base level of data for defense decision-makers, and provide a starting point for further interpretation and comparison in subsequent research.

## **B. LITERATURE REVIEW**

While analysts have studied several aspects of the federal budget and DoD spending over the years, they have often neglected comparing historical trends over different periods within DoN budgets and spending. One academic work claims the DoD's past budgetary experience could lay a framework for the future, as there exists a rising national concern over budget priorities. Candreva and Brook argue that the top line of defense budgets responds to internal and external factors. The authors point out that:

Simply identifying the trends of the last 50 years does not mean that those trends will apply to the next three to five years. We do not have the knowledge to make a point prediction. More than a long-term average is needed and there are other factors that may affect the top line. (Candreva, 2007)

The focus of this study is not to forecast the direction the defense budgets in the next three to five years, but to simply provide a descriptive analysis of the behavior of the defense budget and to understand the nature of DoD and DoN spending during these three periods.

Franklin Spinney, an Air Force military analyst in the Pentagon who retired in 2003, authored the "Spinney Report." This report was his lifelong work, and it criticized the Pentagon for its acquisition of expensive weapons systems that were more costly and less effective than previous systems. Spinney stated that the Pentagon and DoD grossly and negligently pursued expensive and complex weapons systems with no regard for future budgetary implications. This goes to the mindset of military budgeting in that investment accounts affect other appropriation accounts, much to the detriment of expense accounts. Spinney also developed an analysis of the military decision making process, and how it influences the readiness of U.S. forces. He described how those forces were structured, and what factors drove up the costs of individual weapon systems. He pointed out that the complex equipment procured is so expensive to operate and

maintain that the US can afford far fewer than necessary, which results in a steady shrinkage in the size of U.S. forces over the years (Spinney, 1985). The long-term consequences of short-term decisions have resulted in a mismatch between plans and reality, even with an increased defense budget. If past patterns of spending are not changed, U.S. defense problems may get worse instead of better (Spinney, 1985). Spinney goes on to argue that short-term decisions to increase procurement budgets to modernize with costly weapons have resulted in severe cuts in operating budgets. Therefore, training, maintenance, and other support factors necessary for high readiness have been neglected (Spinney, 1985). In addition, his analysis furthers the point raised by Candreva and Brook; internal and external factors in the Pentagon, Congress, and the defense industry have created a desire for higher technology, and that has created long-term consequences for DoD planners and the force structure of the military.

Jones and McCaffery (2008) introduce the basics of the federal budgeting process and provide a historical background on its foundation. They describe both the measurement and analysis of defense spending. They also look at how the Planning, Programming, Budgeting, and Execution (PPBE) process operates, and how it should function to produce the annual defense budget proposal to Congress. According to Jones and McCaffery (2008), the role of Congress is to debate and decide on defense appropriations and the politics of the budgetary process to fund national defense. They also discuss budget execution dynamics its principal participants in the Pentagon and other military commands, and they assess DoD financial management and business practice challenges and issues.

Analysts have studied many aspects of federal budget execution over the years, but the story of the increase and decrease from one time period to another within different budget accounts, with respect to the Department of the Navy, is yet untold. What happened within the Navy's budget that explains the vicissitudes of budget authority from 1975 to 2010? According to Jones and Bixler (1992), problems in contemporary national defense, budgeting, and management include the following:

(1) Savings made by cutting deeply into the defense budget without sacrificing military force structure or the capacity to meet national security requirements and international commitments;

(2) Basic assumptions upon which DoD budgetary strategy rests are overly pessimistic, ill informed, and out of date. This results in poor force structure planning and decision making, the purchase of the wrong military hardware, and widespread misuse of military and civilian personnel;

(3) Mismanagement of RDT&E, Acquisition, and Procurement by the DoD has resulted in cost overruns, gold-plating, and the inoperability and poor maintenance of capital assets.

Jones and Bixler (1992) wrote at the end of the last sustained period of budget growth and hypothesized that “organizational smoothing of reduction over a multiyear period accommodates fiscal restraint more effectively than quick cuts.” They said that even during the “boom or bust years,” if the President and Congress would have used a multi-year approach to reduce “slow spend out accounts” (large acquisitions programs) instead of “fast spend out accounts” (personnel and operations and maintenance), the DoD could have realized a greater and more efficient savings in the end. They also found that specific individual perspectives determined the view of savings as efficient or inefficient. Congressional representatives with constituents affected by the DoD reduction are bound to look for other places to reduce the DoD budget that will not affect their constituents. Members of the DoD will question the sustainability or ability to accomplish the missions of the military when facing a long-term “organizational smoothing.” In addition, those making cuts in procurement and investment accounts will have to consider the long-term effects on the quality and quantity of deployable military force structure.

John A. Williams, a Professor of Political Science at Loyola University Chicago and an academic on civil-military relations and military forces and missions, wrote that the DoN will normally choose “quality over quantity” and that “[DoN] missions and forces are interrelated and missions should determine forces, but force structures cannot

be altered cheaply or quickly” (Williams, 1981). He identified five elements (cost, long lead times, long lifetimes, need for growth potential, and level of risk) that determine the equipment purchased by the Navy. This, in principle, will determine the force structure of the DoN (Williams, 1981). DoN ships, aircraft, and weapons systems are incredibly complex and expensive. They require personnel to build, test, and maintain them, sometimes for several decades. The life expectancy of just one DoN ship is 25 to 30 years, and this does not include a service life extension program to keep the ship sea worthy. Despite the fact that Professor William’s article is nearly three decades old, the sentiment still holds true today. The weapons systems and capital assets purchased today will determine the number and size of our military personnel forces tomorrow and far into the twenty-first century.

The law requires the DoN to provide Congress with an annual shipbuilding report that looks out over the next 30 years. The latest report, issued in February for the FY2011 plan (Director, Warfare Integration, 2010) contains some distinct changes in the Navy’s long-term goals for shipbuilding when compared to the 2009 plan (no 2010 plan was produced). The 2009 shipbuilding plan visualized the purchase of 40 more combat ships and 20 fewer support ships over the entire 30-year period. The 2009 shipbuilding plan estimated an acquisition of 238 combat ships and 58 logistics and support ships, while the 2011 shipbuilding plan estimated a purchase of 198 combat ships, 78 logistics and support ships over the 30-year time-period. The Navy estimated the 30-year purchase of 276 ships would cost \$476 billion (CY2010 dollars), which is 33% less than the 2009 shipbuilding plan. Using the same model, the Congressional Budget Office (CBO) estimated the 276 ships would cost \$569 billion (CY2010 dollars) (CBO Pub. No. 4116, May 2010). Based on current and past trends in shipbuilding over 30 years, the DoN’s ship buying process will preclude it reaching its goal of 313 ships, set by the Chief of Naval Operations, unless Congress doubled the Shipbuilding and Conversion, Navy (SCN) budget (Labs, 2010).

The Navy and Marine Corps operate and maintain a fleet of more than 3800 fixed and rotary wing aircraft, including more than 1300 tactical aircraft. There are possibilities of a significant drop in inventories due to high usage rates over the last

decade (CBO, 2010). Most aircraft have a finite life span of approximately 8,000 flight hours due to fuselage and wing stress from metal fatigue. According to CBO Pub. No. 4113, if the Navy and Marine Corps do not adopt a strategy to either buy more F-18 fighter aircraft and/or extend the service life of current aircraft inventories, the total amount of aircraft will fall to approximately 800 fighter aircraft, “and below the level needed for the planned force structure,” by 2020. The Navy and Marine Corps had hoped the Joint Strike Fighter would be able to replace the aging fleet; however, schedule slips and cost overruns have dashed those hopes. The Navy and Marine Corps will have to adopt a new strategy to keep their inventories and force structure at the level needed to complete their missions.

These ideas explain a little about what has happened with defense force structure growth and reduction over the last 35 years. Other than the aforementioned book and articles, no one has undertaken a significant in depth study analyzing the “what” within the rise and fall of defense budget authority. This study attempts to begin to fill this gap.

## **C. THE RESEARCH QUESTION**

### **1. Primary Research Questions**

This study attempts to answer two primary questions. First, what insights can a comparative analysis of two periods of sustained budget growth and an interceding period of budget decline for the DoN provide? Second, what were the changes in the DoN’s budget allocations, and what were their effects on force structure? Conclusions from this analysis will help educate decision-makers as they budget for and manage the DoN. It is necessary to address a set of subordinate questions before answering the primary questions.

### **2. Secondary Research Questions**

- How have DoN budget allocations for personnel and equipment changed during these periods?
- How has the mix of personnel changed during these periods?
- How have DoN budget allocations for investments and expenses compared during these periods?

- How have the inventories of ships and aircraft changed during these periods?
- How have DoN budget allocations by appropriation changed during these periods?

Understanding the budget trends, force structure, and appropriation allocations from three different periods for the DoN requires approaching the data from multiple directions, including: magnitude, percentage change, resource allocations, and force structure implications.

#### **D. SCOPE, LIMITATIONS, AND ASSUMPTIONS**

Because defense budgeting is one of the most complex processes, incorporating hundreds of variables, shape plans, and resource allocations, this study will only take into account the following factors:

- This study will not attempt to measure the differences in capabilities or quality factors associated with people and equipment.
- This study is only looking at DoN B/A distribution, five main appropriation titles, and force-structure.
- Force structure is defined specifically as ships, aircraft, and personnel (Active, Reserve, and Civilian).
- The term “Expense Accounts” refers to O&M and MILPERS.
- The term “Investment Accounts” refers to RDT&E, Procurement, and MILCON.
- This study will only analyze three particular time periods (1975–1985, 1985–1998, and 1998–2010)

#### **E. ORGANIZATION OF STUDY**

The next six chapters will provide a brief history, background, and analysis of the defense and Navy’s budget authority, appropriation titles, and force structure analysis, which includes personnel, ships, and aircraft. The final chapter will summarize the analysis and state the conclusions, as well as identify future areas of research.

## **II. BACKGROUND**

Government does not make budgetary decisions for defense in a vacuum. The overall outlook for the federal budget and the deficit may dictate the future of defense budgets as much as DoD war-gaming, budgetary exercises, and planning scenarios determine military requirements for defense spending. As long as the current administration and Congress remain concerned about the impact of continuing deficits on the economy, predictions for the growing deficit will likely constrain future defense and federal spending. Therefore, how do the DoD and DoN determine how many ships, aircraft, submarines, and people (civilian and military) should comprise their individual services?

The Government Accountability Office (GAO) interviewed several DoD officials, experts in defense, and the academic community. They found a “broad analytical framework” exists when assessing the U.S. military force structure requirements. GAO/NSAID-93-65 (1993) suggests that, while budgetary and political considerations play a role in driving the force structure proposals, there are five critical policy issues regarding U.S. defense and force structure:

- The nation’s interests
- Potential threats to those interests
- The strategy for countering these threats, including size, nature, and number of contingencies that the U.S. should be prepared to engage in at any one time.
- The future definition of military doctrine
- The level of risk the nation is prepared to take regarding the inability to protect its vital interests.

Another way to answer the question, “How are U.S. military forces determined?” is to describe the Planning, Programming, Budgeting, and Execution (PPBE) process. Planning is the first step in the DoD resource allocation process. Civilians in the Office of the Secretary of Defense (OSD), along with military members in the Joint Chiefs of Staff (JCS) do the planning with participation from the services and the needs of the Combatant Commanders (COCOM’s) in mind. The President issues a National Security

Strategy (NSS) at the beginning of each new administration to define specific strategic outcomes required to meet the missions assigned to the DoD (DoD Strategic Management Plan, 2008). The SECDEF then issues the National Defense Strategy (NDS) to provide guidance to the Chairman of the Joint Chiefs of Staff (CJCS) for the development of the National Military Strategy (NMS). The NDS is also the foundation for the development of the Quadrennial Defense Review (QDR). The CJCS provides strategic direction to the military, through the NMS, consistent with the QDR and NDS. The Planning phase concludes when the SECDEF issues guidance to the services to help them build their program budgets (DAU, 2005).

The purpose of the Programming phase is to allocate resources to support the roles and missions of the Military departments and other defense agencies. During the Programming phase, OSD guidance and Congressional guidance are translated into detailed allocations of time-phased resource requirements that include forces, personnel, and funds. The Programming phase will “cost out” the force objectives and personnel resources in financial terms for six years into the future. This gives the SECDEF and President an idea of the impact that present day decisions will have on the future of the defense posture. The final product of the Programming phase is an individual service’s Program Objective Memorandum (POM), which displays the resource allocation decisions (DAU, 2005).

In August of every even numbered year, the services are required to submit a combined POM and Budget Estimate Submission (BES) to the SECDEF for the six-year future defense programs. The POM/BES submissions are proposals for a balanced allocation of available resources. The POM/BES also identify significant force structure changes, end-strength changes, major milestones in future combat systems, as well as program imbalances and shortfalls (DAU, 2005). Following a thorough review of the POM/BES, the Program Managers (PM), comptrollers, OSD, and the Office of Management and Budgets (OMB) hold budget hearings with each Under Secretary of Defense (USD) comptroller for proper budget justification and execution alternatives.



Once the USD comptrollers signs off on the POM, the services revise their budgets to incorporate the decisions from the concurrent program and budget review process (DAU, 2005).

There are hundreds of independent and dependent variables that determine “how many” aircraft, ships, and personnel the DoD needs to complete its missions in the uncertain future. In addition, hundreds of independent and dependent variables determine “what type” of aircraft and ships the DoD needs to complete its missions in the future. The Goldwater-Nichols Act of 1986 reorganized and changed the way the JCS formulated defense policy and interfaces with the resource allocation process. Some major changes with regard to force structure as follows:

- The Act designated the CJCS, not the Joint Chiefs, who held more biased towards their own services, as the principal military advisor to the President, SECDEF, and the National Security Council.
- It also strengthened the role of the COCOM’s (e.g., PACOM) concerning resource allocation issues at the expense of the component commanders (e.g., PACFLT). The Goldwater-Nichols Act also made the CJCS an inter-service representative for all issues involving the distribution of scarce resources.
- It gave the CJCS additional responsibilities, including assisting the President and SECDEF in the strategic direction of the Armed Forces. This included, reviewing and preparing of contingency plans, developing doctrine, and advising the SECDEF on requirements, programs, and budgets.

The functions of the CJCS are set forth in Title 10, United States Code, and detailed in DoD Directive 5100.1 (2003). The CJCS can consult with and seek advice from the other member of the JCS and COCOM’s as he feels appropriate. According to DoD Directive 5100.1 (2003), the CJCS shall be responsible for the following principle functions:

- Advise and assist the SECDEF on the preparation of annual policy guidance for the Heads of the DoD Components for the preparation and review of program recommendations and budget proposals.
- Prepare strategic plans, including plans that conform to resource levels projected by the SECDEF, to be available for the period of time for which the plans are to be effective.

- Advise the SECDEF on critical deficiencies and strengths in force structure and capabilities (including manpower, logistics, and mobility) and assess the effect of such deficiencies and strengths on national security objectives and policy.
- Advise the SECDEF as to whether or not program recommendations and budget proposals conform with the priorities established in the strategic plans and priorities established by the COCOM's.
- Recommend budget proposals and force structure requirements, pursuant to the guidance of the SECDEF, for the activities of each COCOM, as appropriate.
- Advise the SECDEF on the extent to which the major programs and policies of the Armed Forces in the area of manpower conform to strategic plans.
- To assess military requirements for defense acquisition programs.
- Periodically, but no less than every 2 years, review the missions, responsibilities, and force structure of each COCOM and recommend to the President, through SECDEF, any changes to missions, responsibilities, and force structure, as may be necessary.

The Goldwater-Nichols Act of 1986 and the DoD Directive 5100.1 added several responsibilities to the CJCS. Therefore, they created the J-8 Force Structure, Resources, and Assessment Directorate to support the CJCS on resource allocation issues and force structure analysis. The J-8 is responsible for providing support to the CJCS by evaluating and developing force structure requirements and assessing the sufficiency of joint forces to execute the defense strategy. This enables the CJCS to make informed recommendations to the SECDEF. The J-8 Directorate also provides the CJCS with the necessary means to respond to COCOM's requirements and influence the resources allocated within the DoD. The J-8 staff analyzes individual service programs and provides specific alternatives to OSD. More importantly, the CJCS has the ability to recommend budget alternatives to the services' budget submissions.

## **A. UNDERSTANDING THE NATIONAL DEFENSE BUDGET**

Two measures typically used to discuss the national defense budget are budget authority (B/A) and outlays. Federal law (generally appropriations) provides budget authority that allows government officials to enter into financial obligations that will result in immediate or future outlays involving federal government funds.

An outlay is an issuance of checks, disbursement of cash, or electronic transfer of funds made to liquidate a federal obligation. Outlays also occurs when interest on the Treasury debt, held by the public, accrues and when the government issues bonds, notes, debentures, monetary credits, or other cash-equivalent instruments in order to liquidate obligations (Comptroller, 2010).

DoD and DoN B/A indicate the relative importance of defense spending in terms of spending for all the other activities of the federal government. There are two main categories of federal spending, mandatory and discretionary. The DoD's and DoN's B/A are derived from the discretionary spending account. As a percentage of total federal spending, the DoD comprises approximately 19% and as a percentage of discretionary spending, the DoD comprises approximately 50%. A decrease in the percentage of B/A for defense indicates a movement in governmental priorities away from defense and toward other functions.

Since 1975, the DoD's and DoN's budget authority have sustained two periods of growth, between 1975–1985 and 1998–2010, and a period of interceding decline from 1985 to 1998, as depicted in Figure 1 and Table 1.

DoD and DoN Total B/A in CY2010 (in billions)						
	1975-1985		1985-1998		1998-2010	
Department of Defense	\$371	\$564	\$564	\$383	\$383	\$663
Department of the Navy	\$120	\$194	\$194	\$119	\$119	\$169

Table 1. DoD and DoN Total Budget Authority (From Comptroller, 2010)

According to Jones and Bixler (1992), growth or decline of the DoD budget may be the result of congressional control. Analysts can use a comparison of post 1974 DoD budget growth and decline with Congressional Directives issued during the same period to assess the relationship between these variables using budget as a measure of outlays. Using a similar concept, this project will measure the relationship between the DoN's budget, as a measure of B/A, and its force structure using specific variables such as appropriations, personnel, ships and aircraft. It will then analyze factors influencing the DoN's budget authority to assess the growth and decline periods.

Several factors affect budget authority and outlays. According to Brook and Candreva (2007), investigations of the defense budget over time must compare the following factors that affect B/A and outlays:

- Deficits
- Mandatory & Discretionary Spending/Programs
- Public Opinion
- Appropriations
- Supplemental Appropriations

Many factors affect the budget authority of both the Department of Defense Budget and other departmental budgets, some of which have been touched on already. The following pages will dive further into these definitions and examine how they apply to both the DoD, and, more specifically, the Navy budgeting process.

The Gross Domestic Product (GDP) is one of the primary indicators used to gauge the size of a country's economy. It represents the total dollar value of all goods and services produced over a specific period. The expenditure method is a common approach, calculated by adding total consumption, investment, government spending and net exports. GDP is an indicator of economic output and growth. Real GDP considers inflation, allowing for comparisons against other historical periods to help analyze.

Analysts can measure budget authority as a percentage of Gross Domestic Product (% GDP). The % GDP spent on defense is useful when comparing the defense spending of different countries, as it normalizes the level of spending in terms relative to the size of the nations' economies. They can also measure it as a percentage of total federal outlays. The second relative measure is important to determine the importance of defense spending relative to other federal programs, and the next section will address this.

## **B. UNDERSTANDING NAVY'S BUDGET AND APPROPRIATIONS**

An appropriations act provides budget authority. Congress specifies the purpose(s) for which each particular appropriation may be used, as well as the amount of budget authority provided under each appropriation. The DoN's budget authority is

comprised of the following five major appropriations: Military Personnel, Operation and Maintenance, Procurement, Research Development, Test, and Evaluation, and Military Construction. There are a few other accounts, but for the purpose of this paper, they are statistically irrelevant due to the small percentage of budget authority they encompass.

Military Personnel appropriations fund salaries and other compensation for active and retired military personnel and reserve forces. MILPERS budget activities include Pay and Allowances of Officers, Pay and Allowances of Enlisted, Pay and Allowances of Midshipmen, Subsistence of Enlisted Personnel, Permanent Change of Station travel, and Other Military Personnel Costs.

Operation and Maintenance (O&M) appropriations fund expenses such as civilian salaries, travel, minor construction projects, operating military forces, training and education, depot maintenance, stock funds, and base operations support. O&M budget activities include Operating Forces, Mobilization, Training and Recruiting, and Administration and Service Wide Support.

Procurement appropriations fund those acquisition programs that have been approved for production (to include Low Rate Initial Production (LRIP) of acquisition objective quantities), and all costs integral and necessary to deliver a useful end item intended for operational use or inventory upon delivery. Aircraft Procurement budget activities include Combat Aircraft, Airlift Aircraft, Trainer Aircraft, Other Aircraft, Modification of Aircraft, Aircraft Spares and Repair parts, and Aircraft Support Equipment and Facilities. Other Procurement Navy (OPN) budget activities include Ships Support Equipment, Communications and Electronics Equipment, Aviation Support Equipment, Personnel and Command Support Equipment and Spares and Repair Parts. Investments made with OPN funds finance the procurement, production, and modernization of equipment not otherwise provided for.

Another aspect or division of Procurement would be the Shipbuilding and Conversion (SCN) account. This is a significant account based on the large cost of both

acquiring ships and maintaining them. The formulation of the SCN budget and its relationship to the Shipbuilding Cost Adjustment (SCA) review can be traced through to the President's budget and Congress.

Research, Development, Test and Evaluation (RDT&E) appropriations fund the investment efforts performed by contractors and government activities required for the Research and Development (R&D) of equipment, material, computer application software, and its Test and Evaluation (T&E), including Initial Operational Test and Evaluation (IOT&E) and Live Fire Test and Evaluation (LFT&E). RDT&E also funds the operation of dedicated R&D installation activities for the conduct of R&D programs. RDT&E budget activities include Basic Research, Applied Research, Advances Technology Development, Demonstration and Validation, Systems Development and Demonstration, and Operational Systems Development.

Military Construction (MILCON) appropriations fund major projects such as bases, schools, missile storage facilities, maintenance facilities, medical/dental clinics, libraries, and military family housing. MILCON budget activities include Major construction, Minor Construction, Planning, Supporting, and Operational Systems Development.

Figure 2 shows the distribution of these appropriations in actual dollar values of the total DoD budget authority.

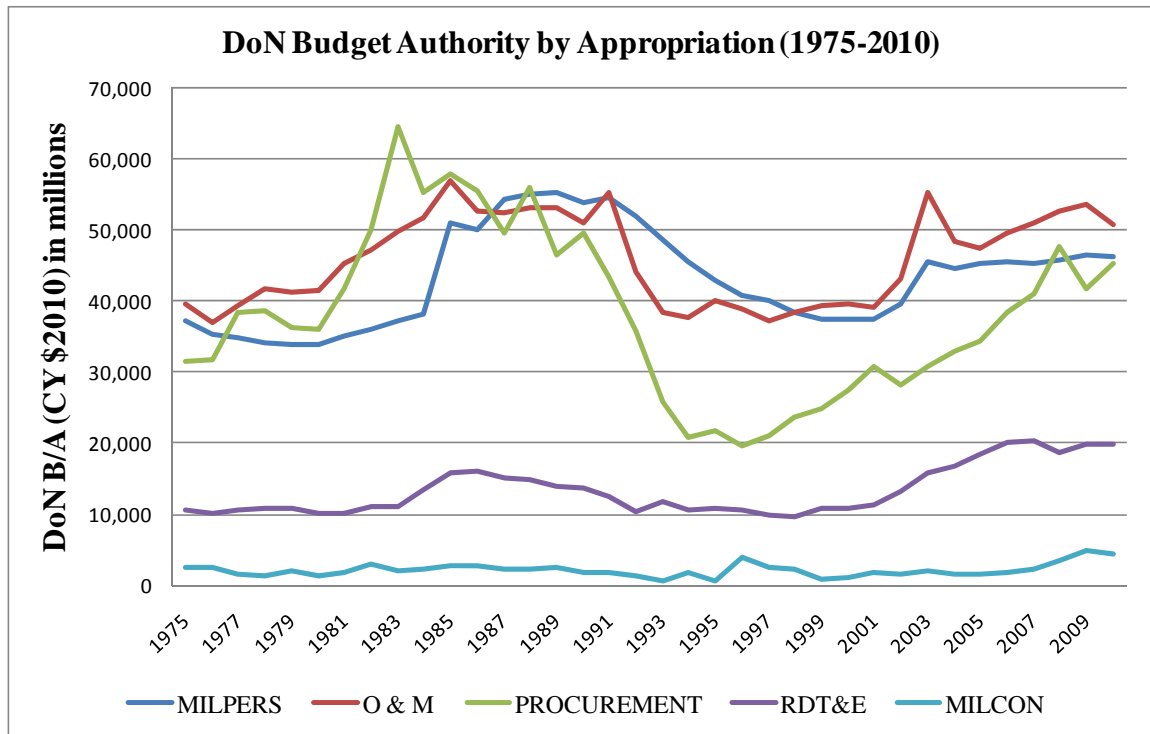


Figure 2. DoN B/A by Appropriation (From Comptroller, 2010)

Figure 3 shows the distribution of these appropriations as a percent of total DoD budget authority. One can see that operating accounts, such as O&M have generally grown in share, while military personnel accounts have decreased. Procurement accounts mirror the cyclical nature of the top line.

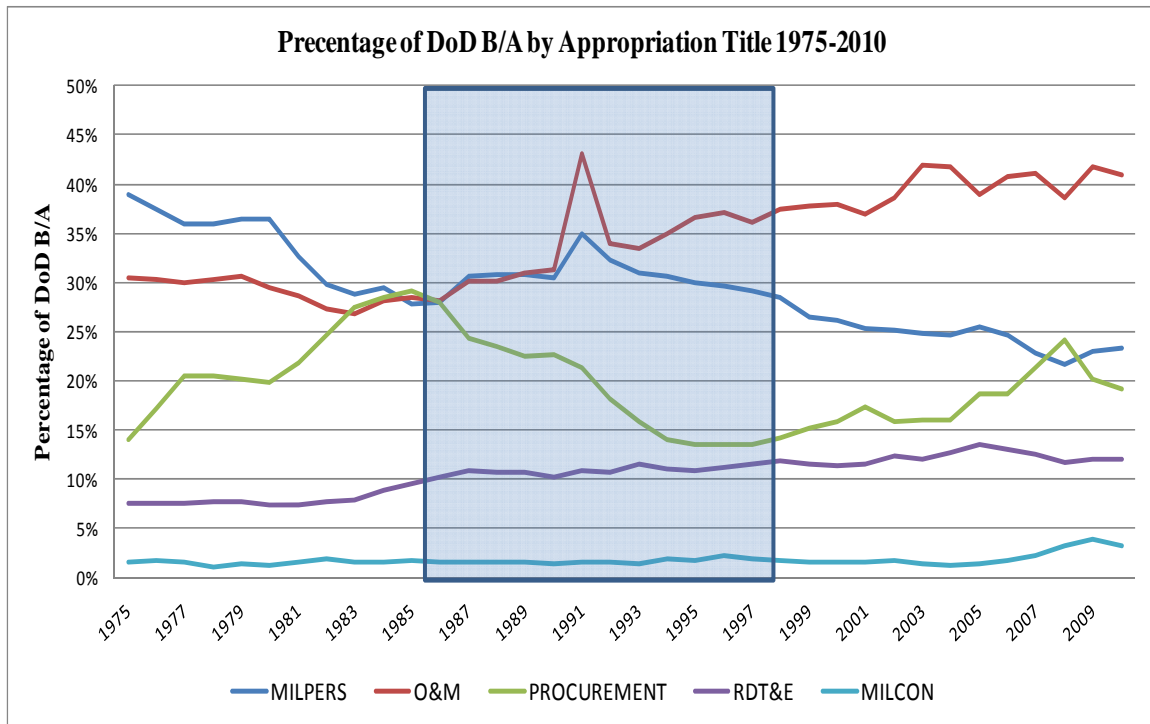


Figure 3. DoD Appropriation Distribution (From Comptroller, 2010)

Budget authority, for the purposes of this study, falls into two different categories. Expense accounts encompass MILPERS and O&M appropriations, and Investment accounts encompass of RDT&E, Procurement, and MILCON.

### C. UNDERSTANDING FORCE STRUCTURE

The structure, design, organization, and disposition of U.S. military forces have changed significantly. America's military has evolved. What exists now differs in some important respects from what existed at the end of the Cold War in 1989, largely because of downsizing the Cold War force structure. New and more powerful precision equipment has replaced older instruments of war, and new kinds of tools have entered the inventories.

The military needs the ability to achieve specific wartime and national security objectives. Moore et al. (1991) found that the military organization includes four major components or “pillars:” force structure, modernization, readiness, and sustainability. Force structure includes numbers, size, and composition of the units that comprise U.S.



defense forces (e.g., divisions, ships, air wings). This study focuses on both manpower and force structure, and it examines how these two key segments of the Department of the Navy's budget have fluctuated inconsistently in relation to the budget authority.

Historically, as the budget rises and falls, so does the force structure. Currently the US is experiencing a period of increased budgets and spending, yet its numbers of people, ships, submarines, and aircraft continue to fall. Large organizations such as the DoD and DoN have requirements and acquisitions processes to recruit and buy people, things, and equipment. The Defense Acquisition System is the management process by which the DoD provides effective, affordable, and timely systems to military and civilian users, and it is governed by the following policies: Flexibility, Responsiveness, Innovation, Discipline, and Streamlined and Effective Management (DoD, 2007). Accordingly, under Title 10, U.S. Code, the DoD services are required by law to "organize, train, and equip" their respective forces. For a requirement or acquisition process to turn into a tangible or intangible product, there has to be an operator or need for some capability. For a military service staff officer, those requirements and acquisitions processes interweave and become an "operational requirement" from the operator in a field level unit or on a ship. The operational requirement is the process by which operators select and propose new weapons systems, people, and equipment to their respective headquarters. Once the service headquarters and the Pentagon approve a true "requirement," they must factor it into their long and medium range plans. The need for a particular capability then shifts to the PPBE process, which functions to finance, develop if necessary, and procure the desired end item.

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### **III. METHODOLOGY**

#### **A. ANSWERING THE RESEARCH QUESTION**

The comparison of two periods of sustained budget growth and an interceding period of budget decline for the Department of the Navy, looking specifically at budget allocations and changes in force structure, consisted of three steps. The first step collected actual budget authority and force structure data from a reliable source. The second step organized the data into a useful presentation format. The last step described and analyzed the data presented. The last step ultimately describes and compares the trend of defense budgeting and force structure during two periods of sustained growth (1975–1985 and 1998–2010) and the interceding period of decline (1985–1998). The scope of this research project is limited to the Department of the Navy's budget authority and force structure; however, this research project will point out major deviations from broader DoD trends, when applicable.

##### **1. Source of Data**

The National Defense Budget Estimates, commonly referred to as “The Green Book,” is a convenient reference source for data about the current budget estimates of the Department of Defense. It also provides current and constant dollar historical data for the department, as well as selected data on national defense, the total federal budget, and the U.S. economy. The edition used reflects the FY 2010 President’s Budget as submitted to Congress in May 2009 (Comptroller, 2010).

Force structure data came from multiple sources to keep all information constant and credible across all three-time periods. The Department of the Navy, Budget Highlights books, and the Naval Historical Center were sources of force structure data that included number of ships, aircraft, and active duty personnel.

All personnel data came from the 2010 National Defense Budget Estimates publication, and a comparison against the yearly individual President’s Federal Budget submissions verified it. This data included all active duty and reserve military personnel, as well as all DoD and DoN civilian employees.

The number of ships active each year from 1975–2009 were gathered from the U.S. Navy Active Ship Force Levels developed by the Naval Historical Center. There was a gap in the data for years 2008 and 2010, so the team used the Department of the Navy, Budget Highlights books to extract the number of ships for those two years.

Department of the Navy aircraft data came from two different sources. Limiting the data origination to two sources enabled the maintenance of continuity. The first source, located on the Naval Historical Center’s website in appendix 4 of the United States Naval Aviation 1910–1995 publication, which is located in the Library of Congress database, covered the period 1975–1993. The second source, found in the Aircraft Inventory Readiness and Reporting System (AIRRS) maintained in the Naval Aviation Logistics Data Analysis (NALDA) Integrated Data Environment, covered the period of 1994–2010. Using two separate sources for aircraft created some difficulty with matching the recording style for the break out of the aircraft into type. Appendix 4 from the Naval Historical Center does not state the method used to designate each aircraft into the categories of combat, transport/utility, observation, rotary wing, or other. In addition, the AIRRS report states the type, model, and series (T/M/S) of each aircraft, but does not designate them as any of the aforementioned categories. To maintain continuity between source documents, the team used its experience and best judgment, along with research about each aircraft, to categorize all T/M/S aircraft from 1994–2010.

## **2. Organization of Data**

The data were organized into three periods: 1975–1985, 1985–1998, and 1998–2010 that represent the peaks and trough of the DoD and DoN B/A over the past 35 years. To maintain consistency of analysis the team converted all dollars to current year (2010 dollars) using the current year’s deflator and the joint inflation from the website for the Naval Center for Cost Analysis. For the purposes of this study, the DoD and DoN B/A used the Total Defense deflator from table 10.1 out of the historical tables on the website for the OMB, while all other factors were converted to constant 2010 dollars using the Total Non-Defense deflators.

By looking at dollar amounts across various years, in the constant-dollar format, one will see “real growth,” or real program change. The data will show how much a product or service increased or decreased in price—without the impact of inflation. With an understanding of current dollars and constant dollars, variations in purchasing power are evident. If one million dollars bought three aircraft in 1907, but only one aircraft in 2008, purchasing power has declined. The consumer now gets less “bang for the buck.” Inflation is usually a dominant factor in the decline of purchasing power.

The organization of the data will allow for relatively easy sorting and manipulation. The data will be organized and sorted in a Microsoft Excel workbook. An Excel spreadsheet serves to organize and sort the data from all of the Navy Budget actions and appropriations. The team collected the following data from each appropriation: MILPERS, MILCON, RDT&E, Procurement, and RDT&E.

### **3. Presentation of Data**

Next, the team developed a consistent method to present the data in a meaningful format. The presentation of the data consists of four parts: Formulation of relevant questions, presentation of data in a graph or table, description of data found in each graph or table, and analysis of data. Following this rubric ensured the consistent presentation of information.

- Formulation of relevant questions—This step provided relevant questions used to describe and answer the primary research question. These questions provided a deeper insight to conduct a comparative analysis of the last two periods of sustained budget growth and its interceding period of decline for the Department of the Navy, and to describe corresponding changes in DoN B/A and force structure.
- Presentation of Data—Graphs and tables are the most efficient way to present the data gathered from the research. They provide a visual representation of the data used to answer the primary and secondary research questions.
- Description of Data—This section further explains the information in the tables and figures and identifies highlights and trends within the information. This focuses the reader’s attention on the applicable results determined from the data collected.

- Analysis of Data—This section provides plausible explanations and analysis for the data found. It also answers the questions provided for each section.

The presentation of data's primary focus will consist of rates of change for the Department of Navy's budget authority and force structure to include personnel, ships and aircraft. That is, the team measured the change in the DoN's budget authority by the change in its distribution across each appropriation and analyzed each appropriation by the rate of change between each period in inflation-adjusted dollars.

Force structure underwent the same analysis. The force structure, in this case, is composed of the number of personnel, ships, and aircraft. The team compared the rate of change for both force structure and each appropriation between each period. These tests will present the best measurements to provide a comparative analysis of the last two periods of sustained budget growth and the interceding period of decline for the Department of the Navy with a focus on the corresponding changes in DoN B/A and force structure.

## **IV. BUDGET AUTHORITY AND APPROPRIATIONS**

To understand the nature of the DoN budgeting, one must analyze changes in its budget authority and the process of allocation. This section will provide a deeper insight into the priorities and interests of the DoN, as well as its plans for the future. The Department of Defense, as whole, has had a significant increase in budget authority over the past 12 years, similar to the growth between 1975 and 1985. Since the end of the Vietnam War in 1975, the DoN's involvement in U.S. military operations has changed and has influenced the use of its budget authority during periods of growth and decline. Both periods of budget growth occurred in either an environment of escalation of hostilities between the United States and world powers or terrorist actions. The first period, 1975 to 1985, revolved around the growth of naval power to counter the Soviet Union during the Cold War. The second growth period followed an increased commitment to combat terrorist threats with focused efforts in Iraq and Afghanistan. This resulted in a shift from building up naval forces to developing a more robust ground force, which also affected DoN budget authority. Budgets are very cyclical in nature, and when there is a growth period, a period of decline usually follows.

There are many ways to analyze funding within the Department of Navy. One option is to look at the total budget authority afforded to the DoN and determine if anomalies exist when comparing the two periods of growth and their relationship to the total budget authority for the DoD. This study also separates budget authority into its appropriation categories to more precisely examine its different aspects and determine reasons for any anomalies in the expected trends. The following chapter will discuss some of the comparison factors in the relationship between the DoD and DoN budget authority and appropriation accounts.

### **A. ANALYSIS OF DoD AND DoN BUDGET AUTHORITY**

Defense budgets run in cycles, with periods of increase followed by periods of decline. For years, many have thought the defense budget would be coming down, but

both the DoD and DoN total budget authority have been growing since 1998. The FY 2010 Department of Navy B/A was 42% higher than in FY 1998 in constant dollars. The DoD had a growth of 73% during the same period.

The concern is not necessarily the money or the total funding of the B/A, but rather where the money is going. Although the DoN had growth in its budget authority during both periods, 1975–1985 and 1998–2010, there is a significant difference in the makeup of the force structure. This is also true for the DoD. Are there any comparisons to be made between the real change in DoD and DoN B/A? Looking into the top line B/A for each department will provide some background for further study.

Figure 4 shows the annual trends in the DoD and DoN budgets since 1975 in dollar amounts. Table 2 shows the real change in the total B/A within both the Department of Defense and the Department of the Navy.

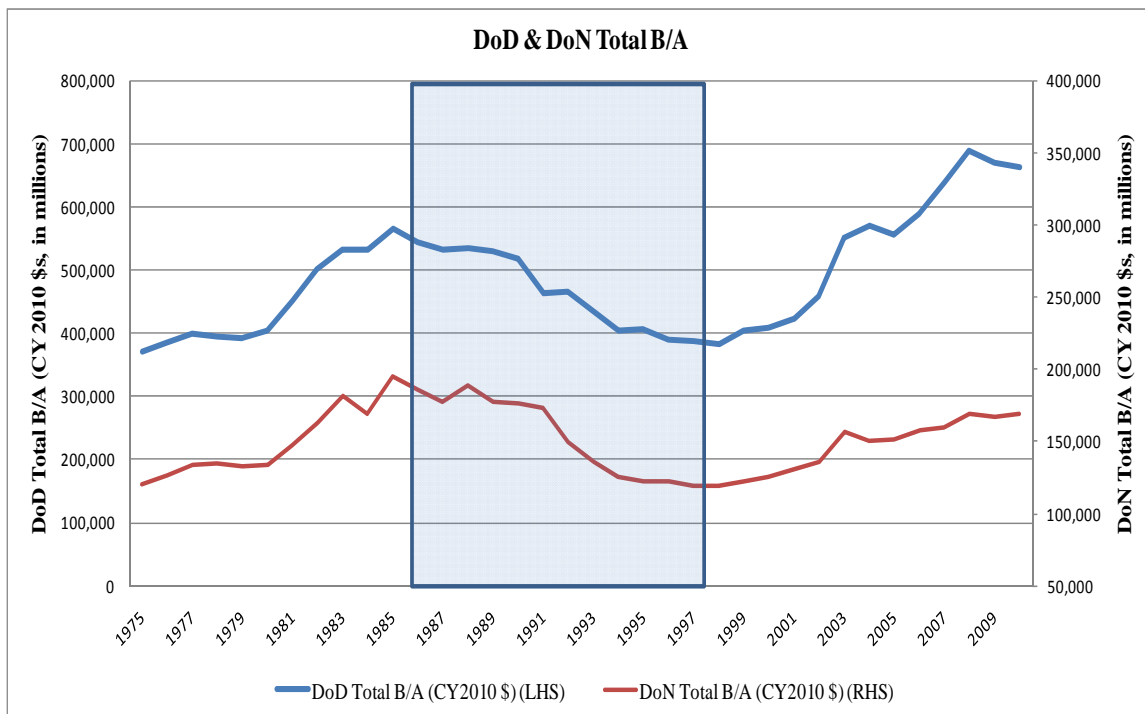


Figure 4. DoD and DoN Total B/A (From Comptroller, 2010)



<b>Total Budget Authority</b>			
	1975 - 1985	1985 - 1998	1998 - 2010
DOD Total B/A (2010 dollars)	<b>52%</b>	<b>-32%</b>	<b>73%</b>
DON Total B/A (2010 dollars)	<b>62%</b>	<b>-39%</b>	<b>42%</b>

Table 2. Real Change in Total Budget Authority (From Comptroller, 2010)

DoD and DoN follow very similar trends throughout the period of 1975–2010. There is some divergence in the data during the third period. Table 2 shows that in the DoD, there was a 73% increase in B/A, while the DoN only rose 42% during the same period. There are several possible explanations for this phenomenon. First, the DoD comprises all of the armed forces. Different percentages of funding allocations occur for any number of reasons. In addition, current world events are major factors on the makeup of the military. During the first and second periods, 1975–1985 and 1985–1998, the government in place was dealing with the buildup of the Navy in order to bolster the show of force during the Cold War. The ensuing draw down drew the DoD’s attention to the high cost of the Navy. This explains the close relationship between the DoD and DoN during the two periods. The third period is different in the way the relationship changes for both departments. The missions that the military deals with are ever changing, and current conditions around the world dictate that the DoD focus more on building and maintaining ground forces than continue building a Navy that already has superiority on the seas. This would explain the divergence in the data starting in 2002. The DoD’s budget increased rapidly. The Navy’s B/A did not. As the DoD developed a greater ground forces presence in Iraq and Afghanistan, the Army grew very quickly in both labor and technology, therefore, it required more funding. Since the Army is a very large department, when its B/A increases, the DoD B/A rate of change can be affected.

## **B. DoN BUDGET AUTHORITY BY APPROPRIATION TITLE**

One way to measure how the DoN allocates its budget authority is to analyze the changes in each appropriation title. Over time, the changes in distribution of B/A among the different appropriations provide insight into where the DoN’s priorities may lie, and how they may shape the future of the Navy and its force structure. Do the amounts of

B/A allocated for each appropriation remain consistent with Total DoN B/A movement? Does the distribution of DoN B/A remain constant during periods of growth? In this section, that analysis begins with a look into the change in distribution of DoN B/A by appropriation title and the relationship between DoN B/A and each appropriation title B/A over the periods under study.

### 1. Analysis of DoN B/A by Appropriation Title

Figure 5 displays the change in DoN B/A by appropriation title in CY \$2010 over all three periods. Tables 3 and 4 display the real growth in DoN B/A by appropriation title over all three periods.

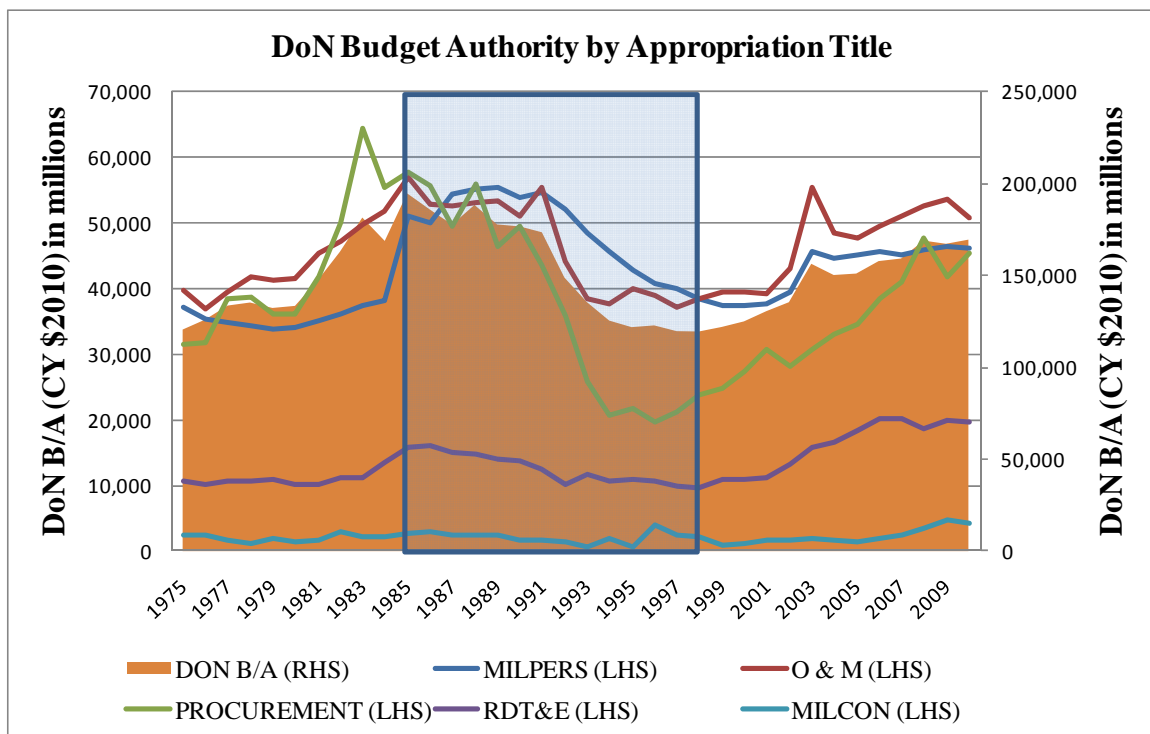


Figure 5. DoN Budget Authority by Appropriation Title (From Comptroller, 2010)

<b>DoN B/A by Appropriation Title</b>				
	<b>1975</b>	<b>1985</b>	<b>1998</b>	<b>2010</b>
<b>MILPERS</b>	37,200	51,063	38,459	46,172
<b>O&amp;M</b>	39,653	57,080	38,376	50,885
<b>PROCUREMENT</b>	31,526	57,826	23,744	45,359
<b>RDT&amp;E</b>	10,650	15,781	9,645	19,770
<b>MILCON</b>	2,525	2,795	2,168	4,353

Table 3. DoN B/A by Appropriation Title

<b>Real Growth DON B/A by Appropriation Title</b>								
<b>1975-1985</b>		<b>Increase</b>	<b>1985-1998</b>		<b>Decrease</b>	<b>1998-2010</b>		<b>Increase</b>
MILPERS	37.3%	13,863	MILPERS	-24.7%	-12,603	MILPERS	20.1%	7,713
O&M	43.9%	17,427	O&M	-32.8%	-18,704	O&M	32.6%	12,509
PROCUREMENT	83.4%	26,300	PROCUREMENT	-58.9%	-34,082	PROCUREMENT	91.0%	21,616
RDT&E	48.2%	5,130	RDT&E	-38.9%	-6,136	RDT&E	105.0%	10,125
MILCON	10.7%	270	MILCON	-22.4%	-626	MILCON	100.7%	2,184
<b>Total DON B/A</b>	<b>61.5%</b>	<b>74,229</b>	<b>Total DON B/A</b>	<b>-38.6%</b>	<b>-75,267</b>	<b>Total DON B/A</b>	<b>41.8%</b>	<b>50,031</b>

Table 4. Real Growth DoN B/A by Appropriation Title (From Comptroller, 2010)

What is immediately apparent is how each appropriation follows consistently with total DoN B/A across all three periods. Figure 6 and Table 5 show that each appropriation rose during the first period of budget growth. Procurement had the greatest growth of all the appropriations and increased from \$31 billion to \$57 billion to post an 83.4% growth. During the intervening period of decline, each appropriation decreased and remained consistent with the DoN's top line. Again, the greatest change occurred within the Procurement appropriation with a negative 58.9% growth. Procurement budget authority fell from \$57 billion to \$23 billion during this time. The second period of budget growth (1998–2010), however, differs from the first (1975–1985), even though during both periods there is an increase in DoN B/A. In this period, the appropriations with the largest growth were RDT&E and MILCON. Both doubled, and Procurement was

not far behind with a 91% real growth. RDT&E increased from \$9 billion to \$19 billion; MILCON increased from \$2 billion to \$4 billion; and Procurement increased from \$23 billion to \$45 billion.

The growth of the MILPERS and O&M appropriation was 17% and 9% lower respectively during the second period of growth. This indicates that the Navy was allocating funds away from expense accounts (i.e., MILPERS and O&M) toward investment accounts (i.e., RDT&E, MILCON, and Procurement). With the larger increases in RDT&E, MILCON, and Procurement during this current period of budget growth, one can conclude that the Navy was investing in its future.

## 2. Analysis of DoN B/A Distribution by Appropriation Title

Table 3 displays the actual dollar amount of DoN B/A distributed across all appropriations. Figure 6 displays the change in distribution of DoN B/A by appropriation title from 1975–2010. Table 5 depicts the real percentage growth during each period for each appropriation title.

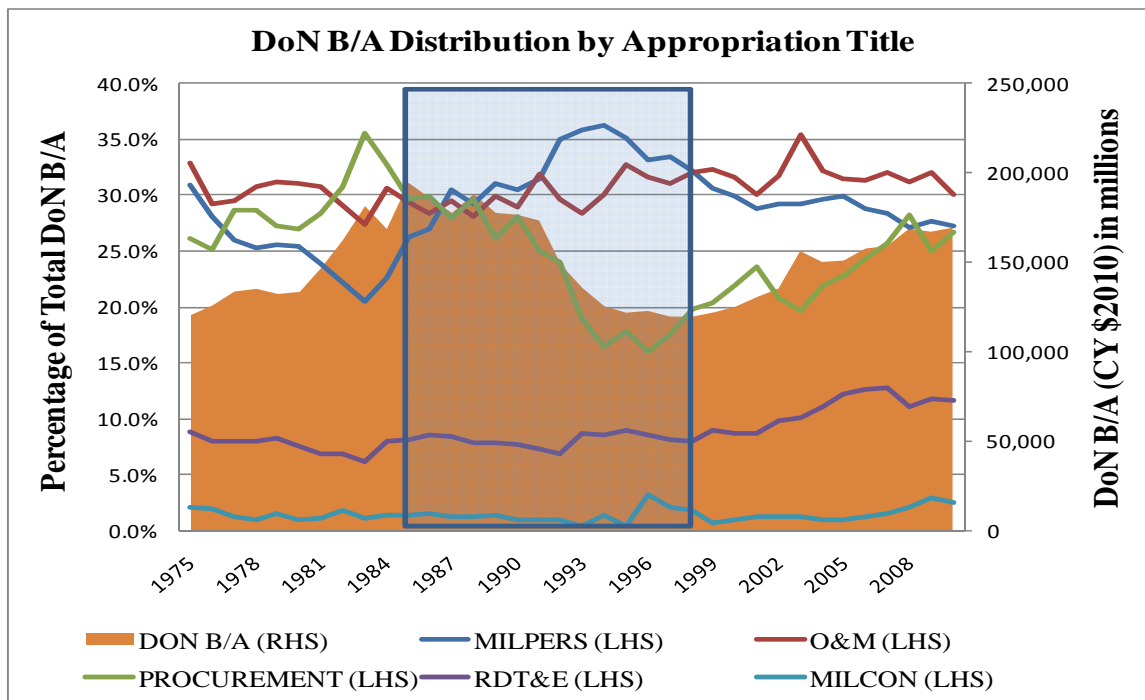


Figure 6. DoN B/A Distribution by Appropriation Title (From Comptroller, 2010)

<b>Average Percentage of DoN B/A</b>			
	<b>1975-1985</b>	<b>1985-1998</b>	<b>1998-2010</b>
<b>MILPERS</b>	25.1%	31.9%	29.1%
<b>O &amp; M</b>	30.2%	30.1%	31.8%
<b>PROCUREMENT</b>	29.1%	23.4%	23.1%
<b>RDT&amp;E</b>	7.7%	8.1%	10.6%
<b>MILCON</b>	1.4%	1.4%	1.5%

Table 5. Average Percentage of DoN B/A (From Comptroller, 2010)

Immediately noticeable is the inconsistent distribution of budget authority across all three periods. If it were consistent, one would expect to see an equal distribution between all appropriations. To help understand the trends among the appropriation accounts, they will be grouped into expense versus investment accounts. During the first period (1975–1985) the figure shows that MILPERS and O&M (expense accounts) make up 55.3% and Procurement, RDT&E, and MILCON (investment accounts) make up 38.2% of total DoN B/A. That illustrates an expense vs. investment ratio of 1.48. During the second period (1985–1998), the expense accounts, MILPERS and O&M, make up 62% and the investment accounts, Procurement, RDT&E, and MILCON, make up 32.9%, which illustrated an expense vs. investment ratio of 1.88. During the third period (1998–2010), the expense accounts make up 60.9% and the investment accounts make up 35.2% of the appropriation funding. The ratio of expense vs. investment for the third period comes in at 1.73. Looking at all three periods, the ratio for the recent growth period is closer to the period of decline than to the last period of growth.

To better understand how the Navy proportions its B/A, one needs to follow where it is allocating its funds. During the first period the Navy allocated most of its funds to O&M and Procurement, which is reasonable considering the nation was recovering from the war with North Vietnam. This distribution indicates that the navy wanted to build its force structure and focused less on compensating its service members. The second period was a relative time of peace for the Navy, despite the Persian Gulf War in 1990–1991. The distribution changes during this period and indicates the Navy is devoting more of its funds to its expense accounts, with MILPERS and O&M making up

64% of DoN B/A. Relatively, the Navy spent more on its investment accounts during the first period than the second period. The third period indicates that the Navy's proportions are similar to what they were during the first period of growth. With the United States at war since 2001, the Navy has seen increase in Procurement B/A, and O&M still has the largest distribution of DoN B/A. MILPERS also shows a decrease similar to that of the first time period. During times of growth, the DoN seems to favor investments over expenses, but during times of decline, it is the opposite.

## **V. PERSONNEL**

Personnel costs are often one of the main drivers of budgets in the public sector. Given the closed personnel system of the military (all senior uniformed personnel are promoted from within), the tools for shaping the force are limited, budget actions have long-term consequences, and desired changes in force structure take a long time to implement. Over the past few decades, the military has used technology to replace or enhance the capabilities of uniformed personnel. Management reforms and budget considerations motivated the department to replace certain military personnel with civilians and certain government employees (uniformed or civilian) with contractors. All of these factors have budgetary and force structure implications. This chapter examines the Navy's budgets during the three periods with a focus on personnel. The first section presents data on the structure of military and civilian personnel. The second section examines the allocation of MILPERS and O&M spending for those personnel. The last section examines overall DoN spending on a per capita basis. In doing this, the team looked for trends within and across the three periods and evidence of these factors.

### **A. STRUCTURE OF DoN MILITARY AND CIVILIAN PERSONNEL**

One method to measure the size of a military is to count the number of men and women in uniform. One might also consider the government civilian employees that support the uniformed force. In addition, one may consider the mix within the military (officers and enlisted, sailors and marines) and civilian (white-collar, blue-collar) force. Over time, one would expect the proportions to vary in response to environmental and managerial actions, as well as the overall size of the DoN budget. Do all categories move as the top line budgets move or is there evidence of “brass creep”—the charge that over time there are proportionally more senior officials than junior personnel? Is there evidence of civilian substitution of military personnel? Is there evidence of outsourcing? Moreover, have such factors influenced the structure of the force consistently in each of the three periods under study? In this section, that analysis begins with an analysis of the DoN Personnel structure.

## 1. Analysis of DoN Officer and Enlisted Force Structure

Figure 7 depicts the overall number of DoN Officers and enlisted personnel, from 1975 to 2010, distinguishing between Navy and Marine Corps. Table 6 is a breakdown of the actual number of personnel and real percentage changes that have been gained or lost in the individual officer or enlisted categories over the three identified periods.

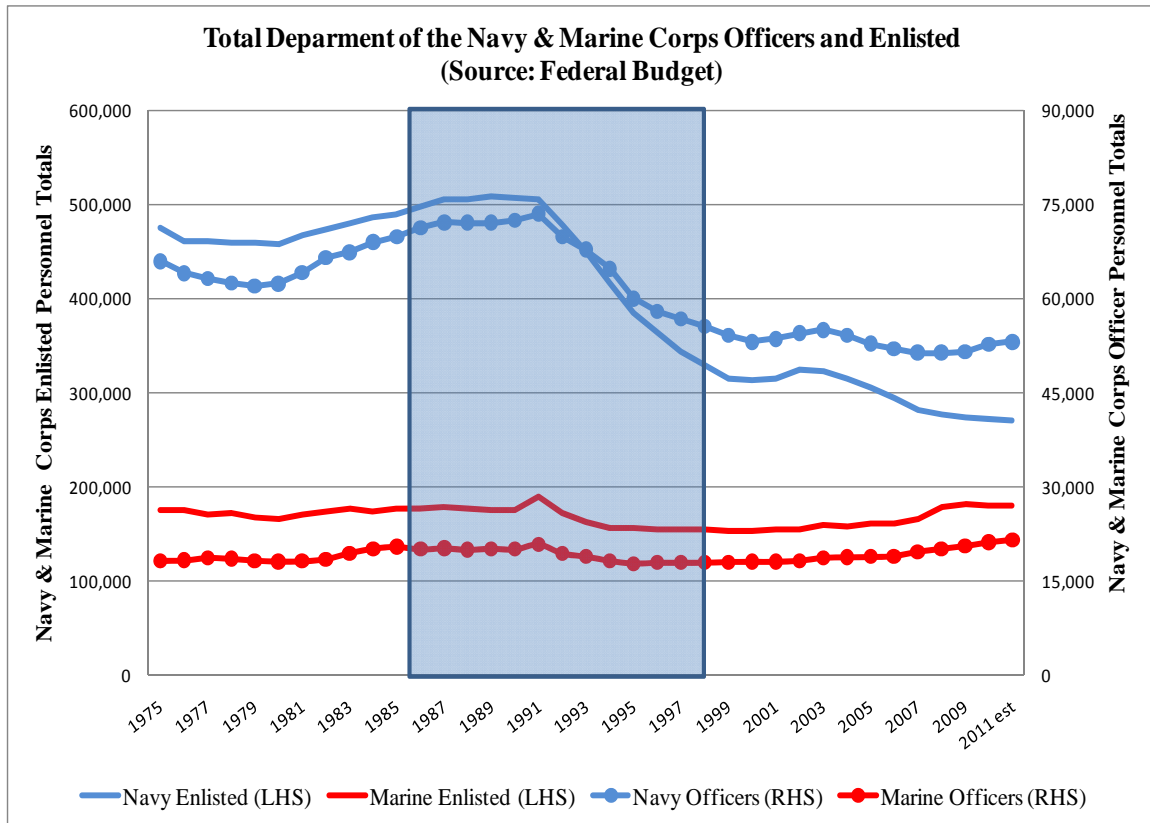


Figure 7. Total DoN Officer and Enlisted Personnel (From Federal Budget 1975–2010)

What is immediately apparent is that the number of personnel in the DoN does not vary consistently with the top line budget for the Navy. If it did, one would expect to see the line trend upward on the two sides and trend downward in the middle. Clearly, that is not the pattern. Notice that the point of inflection on this graph happens in the middle of the period of decline, denoting that the fall in personnel lagged behind the decline in TOA, but was consistent with the MILPERS account. The chart and Table 6 show that all categories of uniformed personnel rose during the first period of budget growth, but



during the second period of growth, the Marine Corps increased in size while the Navy became smaller. During the intervening period of decline, all categories of military personnel shrank. The Marine Corps recovered from the decline of the middle period. It is now larger than at any time during this 35-year period. On the other hand, the size of the Navy peaked in 1991 and steadily decreased in size through the third period, despite an increasing budget. In the first period, about 73% of the uniformed personnel in the DoN wore Navy uniforms. That percentage peaked in 1992 at 74.2% and has fallen steadily since to about 62% today.

In addition, the shifts have not been proportional among officers and enlisted personnel. In general the ratio of officers to enlisted personnel has risen. Table 6 shows that in the first period, growth in the officer corps outpaced enlisted growth, in the second period the decline in the officer corps was less than that of enlisted, and in the third period, the trend continued. One can see that of the two services, the size of the Marine Corps has been stable relative to the size of the Navy. One can also see that the ratio of officers to enlisted personnel in the Navy has shifted more than it has in the Marine Corps. In 1975, 11.5% of the DoN uniformed personnel were officers, in 1985 that climbed to 12%. By 1998, it was 13.2%, and today is 14.1%. There is some evidence of “brass creep,” but the phenomenon is primarily limited to the Navy. The Navy’s ratio went from 11.5% to 18.2%, whereas the Marine Corps’ ratio rose comparatively less, from 9.5% to 10.7%. DoD-wide, the ratio shifted from 13.9% to 16.4% over these 35 years.

Real Change in Distribution over the 3 Periods								
1975 - 1985		Increase/Decrease	1985 - 1998		All Decreased by	1998 - 2010		Increase/Decrease
Marine Officer	12.2%	2234	Marine Officer	-12.4%	-2536	Marine Officer	18.2%	3269
Marine Enlisted	1.5%	2625	Marine Enlisted	-13.0%	-23153	Marine Enlisted	17.2%	26506
Navy Officer	5.8%	3844	Navy Officer	-20.3%	-14160	Navy Officer	-5.1%	-2818
Navy Enlisted	3.2%	15222	Navy Enlisted	-33.0%	-161547	Navy Enlisted	-17.3%	-56877
DOD Officers	3.0%	8850	DOD Officers	-25.6%	-78085	DOD Officers	1.9%	4301
DOD Enlisted	-0.5%	-9158	DOD Enlisted	-35.3%	-644479	DOD Enlisted	-0.2%	-2823

Table 6. DoD and DoN Officers and Enlisted Gains and Losses (From Federal Budget 1975–2010)

## 2. Analysis of DoN Civilian Structure

Does the size of the civilian workforce supporting the DoN follow a similar pattern? Figure 8 reveals a civilian workforce profile that is consistent with the uniformed Navy (officers and enlisted added together) profile, but inconsistent with the USMC uniformed profile. Of all the personnel in the DoN, civilians comprised 44.6% in 1975. Their numbers grew modestly to 45.9% in 1985 fell to 37.8% in 1998 during the middle period of budget decline, and there has been no change during the recent period of budget growth. The ratio in 2010 is also 37.8%, although it dipped to 35% in 2002. Therefore, the civilian portion of the department's personnel grew proportional to the overall growth of uniformed personnel during the periods of growth, but fell more dramatically than the uniformed portion during the period of decline. Curiously, the percentage of the workforce manned by civilians is relatively unchanged in the last period, despite a concerted effort to substitute civilian personnel for uniformed personnel. It is possible that a simultaneous effort to outsource masks the civilian substitution effect. The following sections will further explore the evidence for outsourcing.

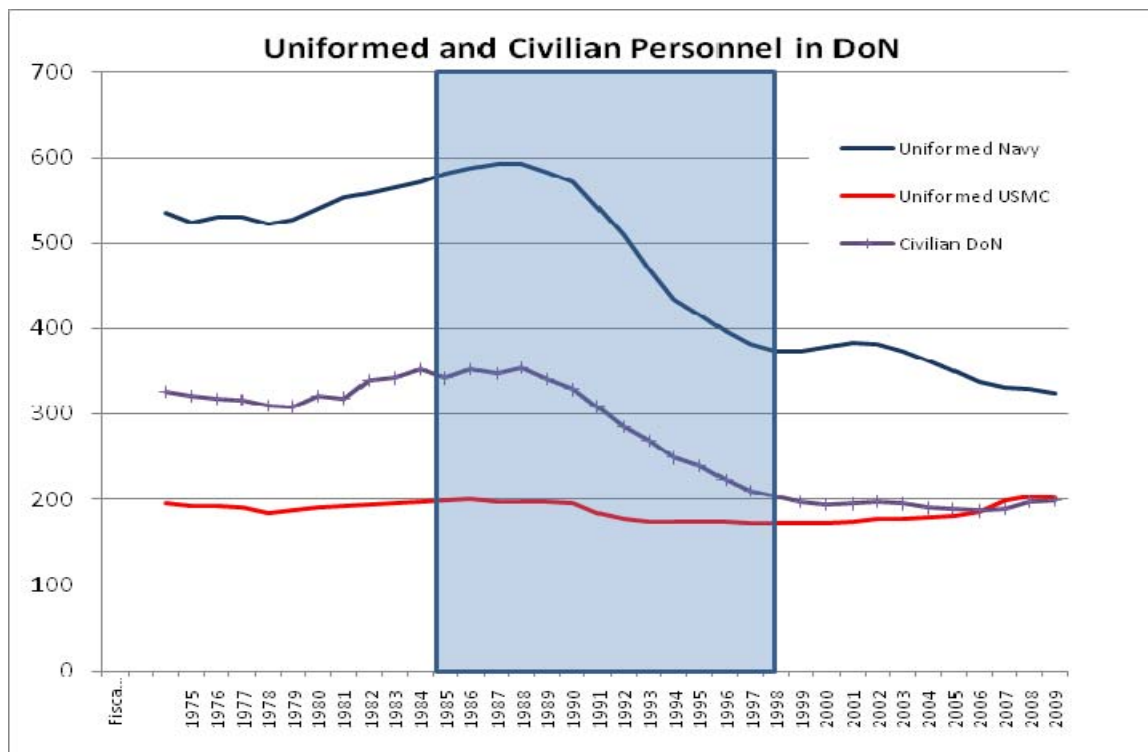


Figure 8. Uniformed and Civilian Personnel in DoN (From Comptroller, 2010)

Unfortunately, the team only had aggregate DoN civilian personnel data with no division between those who support the Navy and those who support the Marine Corps. Therefore, one cannot determine whether the ratio of uniformed to civilian personnel changed for each service.

One thing that is noticeable, as stated earlier, is the trend in personnel. All three divisions of personnel peaked at the same time in the mid to late 1980s. There is a definite lag between the declines in total Budget Authority, but it does tend to follow with the declines in MILPERS appropriations.

Just as there was an increase in the proportion of officers in the uniformed force, there has been an increase in the proportion of white-collar type jobs in the civilian workforce. Figure 9 displays DoD-wide data of the civilian workforce payroll by category of civilian employee. DoN-only data were unavailable, but it is believed that the distribution of civilians across the military departments is similar. One can see a steady rise in the payroll for General Schedule employees (at least since 1981) who normally do managerial and administrative tasks similar to those performed by the officer corps or senior non-commissioned officers. In contrast, there is a steady decline in the payroll for Wage Board employees, who generally are skilled or unskilled people who perform the “blue collar” typically done by enlisted personnel in the services. The greatest divergence occurred during the period of budget decline, when there was a 25% increase in GS payroll, while there was a 50% decrease in the WB payroll. It would be overly simplistic, and data is not available to support the conclusion, but there is anecdotal evidence that WB workers were more prone to outsourcing, and the GS workers were more likely serving as substitutes for military personnel. In addition, as wage board employees become more educated or skilled, they moved into the supervisory or managerial roles that claim the GS positions and earn more pay.

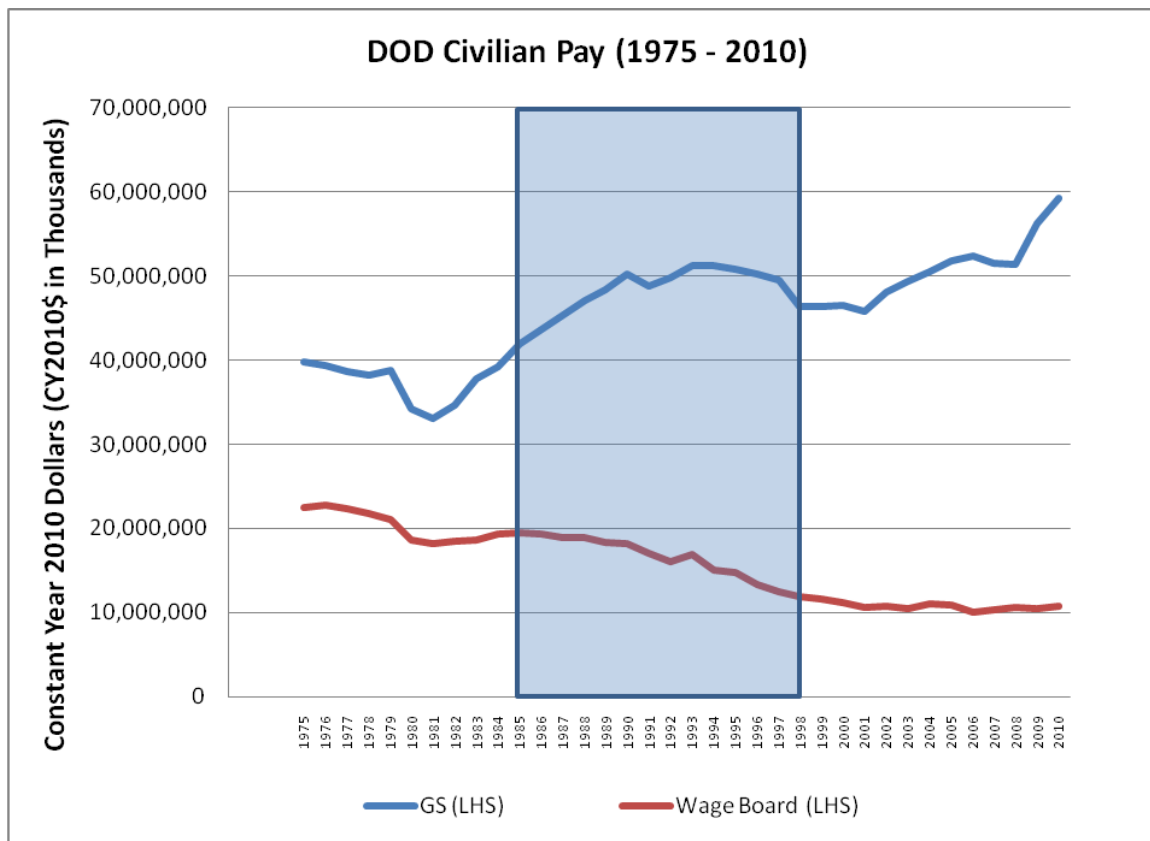


Figure 9. DoD Civilian Pay (1975–2010) (From Comptroller, 2010)

To better understand budget trends during these three periods, the next section analyzes the demographic data in light of the appropriations that pay for personnel.

## B. ALLOCATION OF MILPERS AND O&M SPENDING FOR PERSONNEL

Another way to measure trends in uniform and civilian personnel is to gauge how much budget authority is allocated to the relevant appropriation accounts. Uniform military personnel pay and benefits come from the Military Personnel appropriation (MILPERS), whereas civilian pay and benefits come from the Operation and Maintenance appropriation (O&M). When looking at the data, it is important to delineate that the relationship between MILPERS and military personnel is different from the one between O&M and civilians. There is a close connection between uniformed military personnel and MILPERS, since funding those personnel is the main purpose of the account. O&M, on the other hand, handles much more than just the payment of civilians.

Throughout the three periods, one would expect the amount of these accounts to vary in response to number of personnel in each category and the overall fluctuation of the DoN budget. Is there a relationship between the number of personnel, either active duty or civilian, and their respective appropriation accounts? Does the level of funding for MILPERS and O&M match existing trends in DoN total B/A? In this section, that analysis begins with an analysis of the DoN appropriations for personnel.

### 1. Analysis of MILPERS and O&M

Figure 10 visually expresses the number of DoN Personnel, both military and civilian, from 1975 to 2010. The bar graph represents the number of personnel per year for each sector, and the line graph represents the funding allocated to each appropriation account for each year.

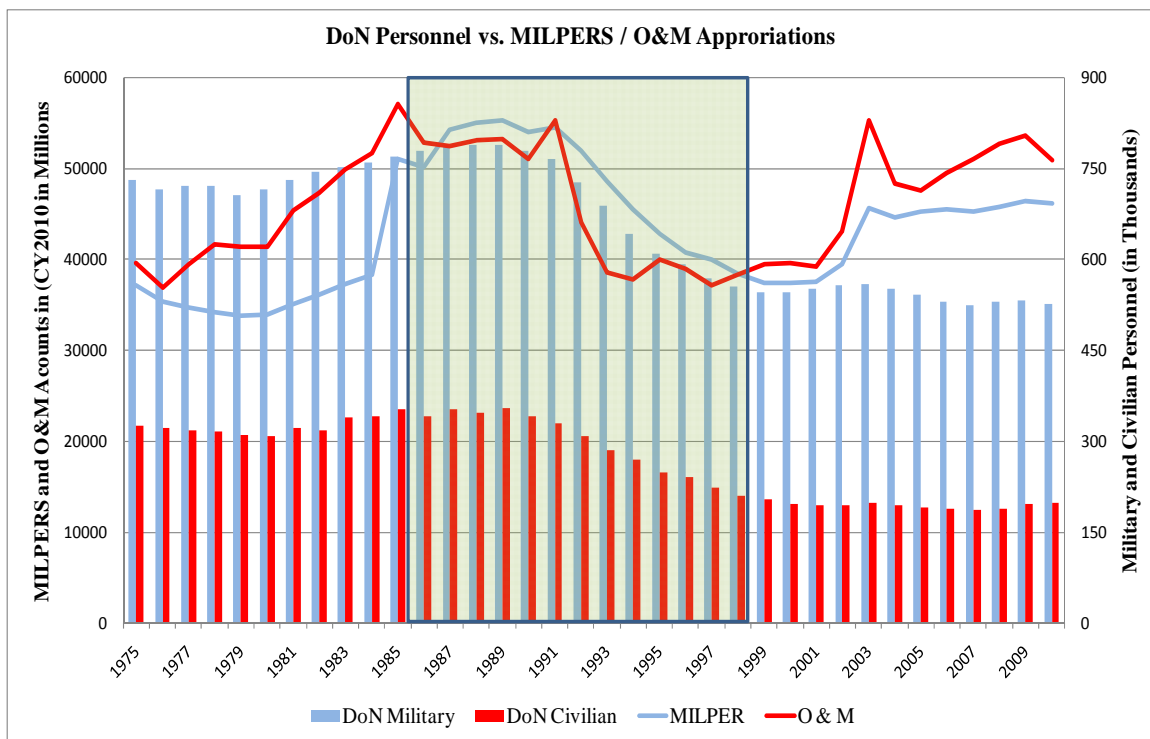


Figure 10. DoN Personnel vs. MILPERS / O&M Appropriations (From Comptroller, 2010)

The first thing that comes to mind when reviewing this chart is that the appropriation accounts do not follow the same trends as the personnel data in all three periods. Throughout the first two periods, military and civilian personnel and both of the appropriation accounts have similar movement, which coincides with the top line DoN budget authority. The pattern changes in the third period when appropriations increase without a corresponding increase in the number of personnel.

Table 7 describes the real change to each of the appropriation accounts, personnel data, and dollar per person for each period. The table shows that MILPERS has an increase of 20.1% in period three, and the DoN Military personnel drop by 5.2%. Therefore, one sees an increase of 26.7% in MILPERS dollars per uniform personnel. Table 7 also illustrates that O&M funding increased by 32.6%, while the DoN Civilian population decreased by 5.2%. As expected, there was an increase of 39.9% in O&M per civilian. One would expect that if the funding for MILPERS is growing, then the numbers of military personnel would also be going up, but this is not the case. This is the most difficult concept to understand. The MILPERS account has only a few divisions and military personnel pay is by far the largest. A possible explanation is that personnel are being paid better today than in the past. A decrease in the number of people, coupled with an increase in pay could explain these two opposite trend directions. The increase in MILPERS dollars per person confirms this idea. In other words, the increase in pay may relate to retention and the fight against the pay gap between military and civilian careers. A CBO study also reported that the key statistic widely cited to represent the military “pay gap” and used to justify the large military pay increases “does not accurately measure what it purports to.” CBO concluded that relying on this statistic to set pay raises “is inappropriate” (CBO, 1999). Although the report states that this might not be the correct measurement for pay increases, it is what Congress and other policy makers use to make decisions.

<b>Personnel and Appropriation Real Change</b>			
	<b>1975-1985</b>	<b>1985-1998</b>	<b>1998-2010</b>
<b>MILPER</b>	37.3%	-24.7%	20.1%
<b>DON Military</b>	5.2%	-27.8%	-5.2%
<b>MILPER per Person</b>	30.5%	4.4%	26.7%
<b>O &amp; M</b>	43.9%	-32.8%	32.6%
<b>DON Civilian</b>	8.3%	-40.5%	-5.2%
<b>O&amp;M per Person</b>	40.6%	13.0%	39.9%

Table 7. Personnel and Appropriation Real Change (From Comptroller, 2010)

When looking at the O&M appropriations alongside the DoN civilian data similar trends are evident. Throughout the first two periods, the civilians and the appropriation account mirror each other. During the period of growth, 1975–1985, there is an increase in O&M of 43.9%, and DoN civilians also increased by 8.3%, which is expected. When looking at the second period of growth, 1998–2010, there is an opposite reaction. The O&M appropriation, in the third period, continued to have growth of 32.6%, yet the civilian population fell by 5.2%. When looking at the O&M per person, there was an even larger increase than the aforementioned MILPERS per person. The O&M account had a 12.5% greater increase in funding, yet maintained the same decrease in personnel as the military. Although it looks as if civilian personnel are receiving more money per person than are military personnel, there is a reason why this would occur.

The O&M appropriation account is comprised of many different categories, and civilian pay is just one of those categories. This account pays for most of the current operations funding, therefore the current state of our military operation schedules could easily explain the large increase in funding accompanied by a drop in civilian personnel.

### **C. DoN SPENDING PER CAPITA**

Another way to measure the size and health of the DoN is to look at spending in various categories per uniformed member or per civilian. Per capita is typically for a measure of a nation's wealth. For the purposes of this thesis, the application of per capita

will occur by dividing amount of money in the appropriation title by the number of personnel, and then comparing per person dollars spent within total DoN B/A and also within each of the appropriation accounts. Does the number of military and civilian employees change as quickly or as slowly as the DoN total B/A and its individual appropriations accounts? This section begins by looking at the raw data to get a picture of the actual changes occurring. Then it examines at the real change in dollar amount per person using the DoN and Marine Corps active duty personnel and then just the DoN civilians. Over time, one would expect the proportions to vary in response to environmental and managerial actions, the overall size of the DoN B/A and the DoN appropriation titles. Do all appropriation titles per capita move as the top line budgets move or is there evidence of one or two per capita accounts growing faster or slower than the other appropriation accounts? In this section, that analysis begins with an examination of the overall DoN spending per capita by appropriation title with Navy and Marine Corps personnel only.

### **1. Navy and Marine Corps Only Per Capita Spending**

In Table 8, during the period of declining budgets, the MILPERS B/A dollars per person still had a positive real change of 7.5%. Looking specifically at the table, the DoN MILPERS account declined from \$51 billion in 1985 to \$38.5 billion in 1998 and still had a 4.36% increase in its MILPERS B/A dollars per person. The Navy decreased its ranks by 189,000 troops, while the Marine Corps let 25,000 Marines out of the service. In 1985, the MILPERS B/A dollars per person were \$66,401 per person, and in 1998 the MILPERS B/A dollars per person was \$69,295. Therefore, even though the MILPERS account went down by almost 25%, there was still an increase of 4.36% MILPERS B/A dollars per person.



<b>Navy, Marine Corps and DoN Civilian B/A \$'s per Capita Changes in B/A, Percentage and Personnel</b>				
<b>DoN B/A in CY2010\$'s (in Millions)</b>	<b>1975</b>	<b>1985</b>	<b>1998</b>	<b>2010</b>
MILPERS	\$37,200	\$51,063	\$38,459	\$46,172
O&M	\$39,653	\$57,080	\$38,376	\$50,885
Procurement	\$31,526	\$57,826	\$23,744	\$45,359
RDT&E	\$9,888	\$15,781	\$9,645	\$19,770
<b>% Real Change (in DoN B/A)</b>				
MILPERS		37.3%	-24.7%	20.1%
O&M		43.9%	-32.8%	32.6%
Procurement		83.4%	-58.9%	91.0%
RDT&E		59.6%	-38.9%	105.0%
<b>Number of Personnel</b>				
Navy & Marine Corps	731,000	769,000	555,000	526,000
DoN Civilians	326,000	353,000	210,000	199,000
<b>% Real Change (in Number of Personnel)</b>				
Navy & Marine Corps		5.2%	-27.8%	-5.2%
DoN Civilians		8.3%	-40.5%	-5.2%
<b>Actual Gain/Loss in Personnel</b>				
Navy & Marine Corps		38,000	-214,000	-29,000
DoN Civilians		27,000	-143,000	-11,000
<b>Actual DoN B/A \$'s per Person by Category</b>				
MILPERS B/A \$'s per person (Navy and Marine)	\$50,889	\$66,401	\$69,296	\$87,780
O&M B/A \$'s per person (Navy and Marine)	\$54,244	\$74,226	\$69,145	\$96,739
PROCUREMENT B/A \$'s per person (Navy and Marine)	\$43,100	\$75,190	\$42,800	\$86,200
RDT&E B/A \$'s per person (Navy and Marine)	\$13,500	\$20,520	\$17,370	\$37,600
O&M B/A \$'s per person (Civilian)	\$121,634	\$161,699	\$182,741	\$255,702
PROCUREMENT B/A \$'s per person (Civilian)	\$96,700	\$163,800	\$113,100	\$227,900
RDT&E B/A \$'s per person (Civilian)	\$30,300	\$44,700	\$45,900	\$99,000
<b>% Real Change (in B/A \$'s per person)</b>				
MILPERS B/A \$'s per person (Navy and Marine)		30.5%	4.4%	26.7%
O&M B/A \$'s per person (Navy and Marine)		36.8%	-6.8%	39.9%
PROCUREMENT B/A \$'s per person (Navy and Marine)		74.4%	-43.1%	101.6%
RDT&E B/A \$'s per person (Navy and Marine)		51.7%	-15.3%	116.3%
O&M B/A \$'s per person (Civilian)		32.9%	13.0%	39.9%
PROCUREMENT B/A \$'s per person (Civilian)		69.4%	-31.0%	101.6%
RDT&E B/A \$'s per person (Civilian)		47.4%	2.7%	116.3%

Table 8. Per Capita Changes (From Comptroller, 2010)

Table 8 also contains the breakdown of the real percent change (per active duty Navy and Marine Corps personnel) gained or lost in the total DoN B/A and the individual appropriation categories over the three identified periods.

It is apparent that during the two periods of increasing budgets, the per capita trends follow the Navy's top line trends very consistently, and during the period of declining budgets, the trend continues, with exception of MILPERS B/A dollars per person. From 1975 to 1985, the U.S. Navy grew modestly from 535,000 to 571,000 sailors, while the U.S. Marine Corps grew from 196,000 to 198,000, which is a 6% and 1% growth respectively, despite a total DoN B/A dollars growth of 53% per person and a 31% growth in DoN MILPERS B/A dollars per person. In CY2010 dollars, the total DoN B/A grew from \$119.6 billion dollars in 1975 to \$196.8 billion dollars in 1985, which is a 62% increase, while the Navy and the Marine Corps personnel only grew by 6% and 1% respectively.

As mentioned earlier, for many people in the acquisition realm, the 1980s were the procurement "heyday," and from Table 8 one can see that during the first period the Procurement B/A dollars per person is the largest real growth account for the DoN. One can see the distribution of growth across all appropriation accounts is quite even during the first period of growth. However, during the second period of growth the Procurement, RDT&E, and MILCON B/A dollars per person far outpace the MILPERS and O&M B/A dollars per person. This could be a result of fewer Navy and Marine personnel in uniform or the fact that those investment appropriation accounts received a larger per capita slice of the total DoN B/A pie.

## **2. DoN Civilian Only Per Capita Spending**

Table 8 also provides a breakdown of the real percent change (per DoN Civilian personnel only) gained or lost in the total DoN B/A and the individual appropriation categories over the three identified periods. The table investigates the real percent change with respect to the DoN Civilian personnel only.

Despite nearly a 40% cut to the overall DoN's B/A from 1985 to 1998, there is only one appropriation category (Procurement) that was cut enough to show a negative per capita decrease with respect to DoN civilian personnel in the period of declining DoN B/A. The DoN civilian personnel went from 353,000 employees in 1985 to 210,000 employees in 1998; this is a 40.5% reduction in the number of DoN civilian employees

over the intervening time of declining budgets. In CY2010 dollars, the DoN Procurement B/A declined from \$57.8 billion in 1985 to \$23.7 billion in 1998, which is a 57% decrease and was the only appropriation account that took a deep enough cut to show a negative growth per capita when compared to DoN Civilian employees. All the other appropriation accounts experienced a smaller cut in their budgets, as compared per capita to DoN Civilians. Looking at one example, in CY2010 dollars, the 1985 DoN's O&M B/A was \$57.1 billion dollars. There were 353,000 DoN civilian employees in 1985, which equates to \$161,756 O&M B/A dollars per DoN civilian employee in 1985. The 1998 DoN's O&M B/A was \$38.4 billion dollars, and there were 210,000 DoN civilian employees. In CY2010 dollars, that equates to \$182,857 O&M B/A dollars per DoN civilian employee in 1998. Therefore, there is a 13% increase in real DoN O&M B/A dollars per DoN civilian employee.

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## **VI. SHIPS AND AIRCRAFT**

Since the establishment of the United States Navy, ships and aircraft have been the cornerstone of naval readiness and the key element of maintaining sea and air superiority for the United States. Different categories of ships and aircraft project power around the world. Over the past thirty years, the Navy has used technology to enhance the capabilities of its ships and aircraft. However, budget constraints and rapid advancements in technology have motivated the Navy to reduce its number of ships and aircraft to maintain its mission readiness and supremacy. These factors have budgetary and force structure implications. This chapter examines the Navy's budgets during the three periods, with a focus on ships and aircraft. The first section examines the pattern of Shipbuilding and Conversion Navy (SCN) and total DoN budget authority, along with the total number of Navy ships. It also presents data on the structure that comprises the total number of Navy ships. The second section examines total DoN B/A, Aircraft Procurement Navy (APN) against the total number of aircraft. Then it explores the different categories of aircraft and their structure. In doing so, for the section identifies trends within and across the three periods and provides evidence of these factors.

### **A. STRUCTURE OF DoN SHIPS**

According to the Chief of Naval Operations Adm. Gary Roughead, the future fleet should have at least 313 ships. There is always a call for replenishment of the fleet. On average, most ships, other than aircraft carriers, last around 30 years. This means the Navy would have to build more than 12 ships every year during the next 18 years, at an estimated annual cost of \$23 billion to \$25 billion, to reach that goal. Today, the DoN has 287 active ships. While the array of capabilities in the fleet is critical, so is the number of platforms. A ship only can be in one place at one time, and with global responsibilities increasing, the Navy must deploy an ever-growing percentage of its ships at any given time to meet security requirements.

One way to measure the capabilities of a navy is to count the number of ships and breakdown the different types of ships in its inventory. One may also consider the changes in the type of ships a navy has over time. Over time, one would expect the distribution of ship type and size to vary in response to technological advances, the overall amount of the DoN budget, and its allocation of SCN B/A. Does the total number of ships move in response to DoN budgets and SCN, or does it move based on advancements in technology? Moreover, have such factors influenced the structure of the naval ship force consistently in each of the three periods under study? In this section, that analysis begins with a look at the DoN B/A, its SCN B/A allocation, and its relationship to the total number of Navy Ships.

### 1. Analysis of DoN B/A, SCN and Total # of Naval Ships (1975–2010)

Figure 11 displays the change in total DoN B/A, Shipbuilding and Conversion Navy (SCN) and the total number of Navy ships from 1975–2010.

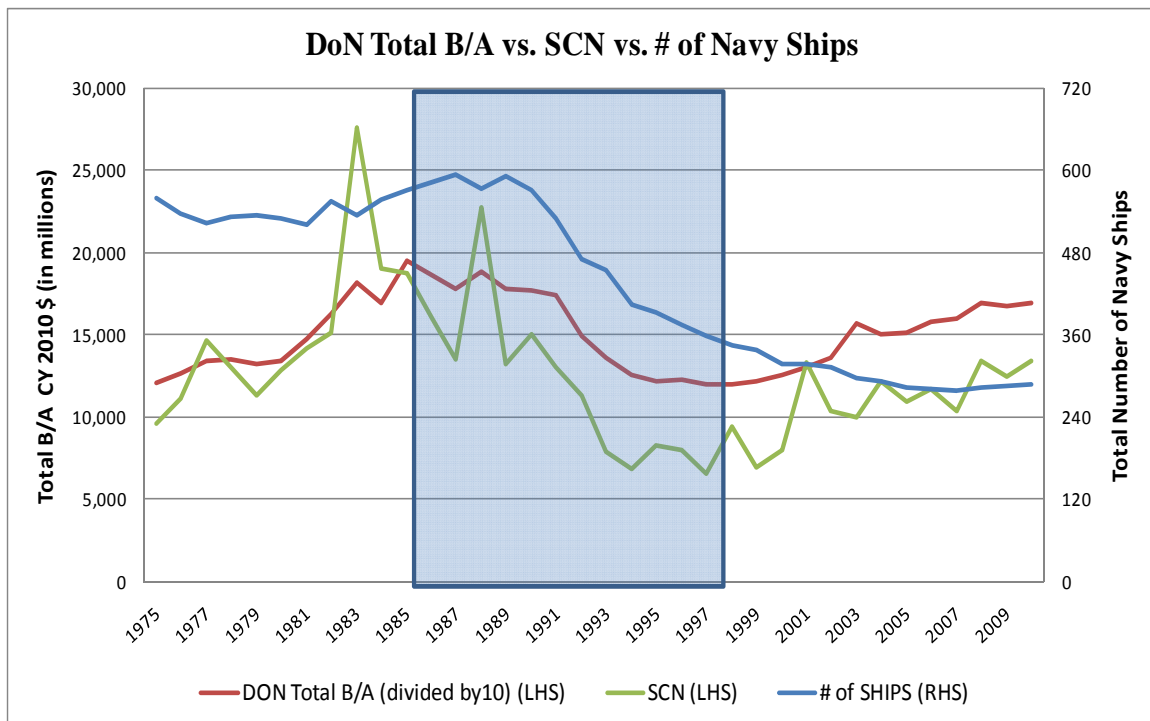


Figure 11. DoN B/A vs. SCN vs. # of Ships (From Comptroller 2010; Federal Budget 1975–2010; Naval Historical Center, 2010)

It is clearly illustrated that the total number of ships in the DoN does not vary consistently with its top line budget or its SCN B/A. If it did, one would expect to see the line trend upward on the two sides and trend downward in the middle. Clearly, that is not the pattern, the number of ships and DoN and SCN B/A lines are roughly parallel during the first two periods, but during the third period, they have opposite slopes.

Figure 11 shows that the total number of ships rose during the first period of budget growth from 559 to 571 along with DoN B/A and SCN. However, the total number of ships increased by only 2%, while SCN increased by 95% and DoN B/A increased by 62%. Steep increases in B/A led to a small increase in forces during this period of sustained growth. During the intervening period of decline, all three decreased, with total number of ships peaking in 1987 at 594. This peak lags two years behind the peak of the DoN B/A, which peaks in 1985. This is close to the same time that the DoN personnel peaked in 1988. After its peak in 1987, the total number of ships fell steadily through the third period, despite an increase in both DoN B/A and SCN by 42% from 1998–2010. During this period of growth, the total number of Navy ships decreased by 16% from 344 to 287.

Readiness measures the ability of a military unit, such as a carrier battle group, to accomplish its assigned mission. Logistics, available spare parts, training, equipment, and morale, which are a part of Operations and Maintenance, all contribute to readiness. Advancements in technology and the methods of shipbuilding have decreased the need for a large number of ships to maintain the Navy's readiness.

The increases in capabilities of ships to perform and complete missions have contributed to a decrease in ships since 1987. The increase in capabilities does not come without cost. Over the past 30 years of shipbuilding and conversion, the DoN, on average, has spent approximately \$13 billion dollars a year on new ships and conversions for older ships, including refueling nuclear aircraft carriers and submarines. The average real cost of Navy ships has increased, outpacing Pentagon projections and growing from \$1.2 billion during the 1980s to at least \$2.5 billion in 2009.

During this last period of budget growth, the Navy built an average of 5.4 ships annually, and its annual shipbuilding budget is now about \$11 billion. An elevated cost per ship reduces the possible number of ships that purchased each year. The average cost of a Navy ship has increased from \$1.2 billion in the 1980s to, according to the DoN 2011 shipbuilding plan, \$2.5 billion per ship, and the DoN had expectations of purchasing 9.9 ships per year. All dollar amounts are in CY2010 dollars.

During the second period of sustained growth (1998–2010), the number of ships purchased on average each year declined from 17.2 to 6.0. With the rising prices of labor and materials, as well as the escalating prices of ships, the DoN purchased fewer ships. Yet, the shipbuilding industry still has fixed overhead costs that it must allocate to fewer and fewer units of sales (CBO Pub. No. 4069, 2010).

## **2. Analysis of Naval Ship Distribution (1975–2010)**

Figure 12 displays the change in the total number of naval ships by category across all three periods (1975–1985, 1985–1998, and 1998–2010). Table 9 depicts the actual number of ships at a given point in time that correlates to either the beginning or end of a period.



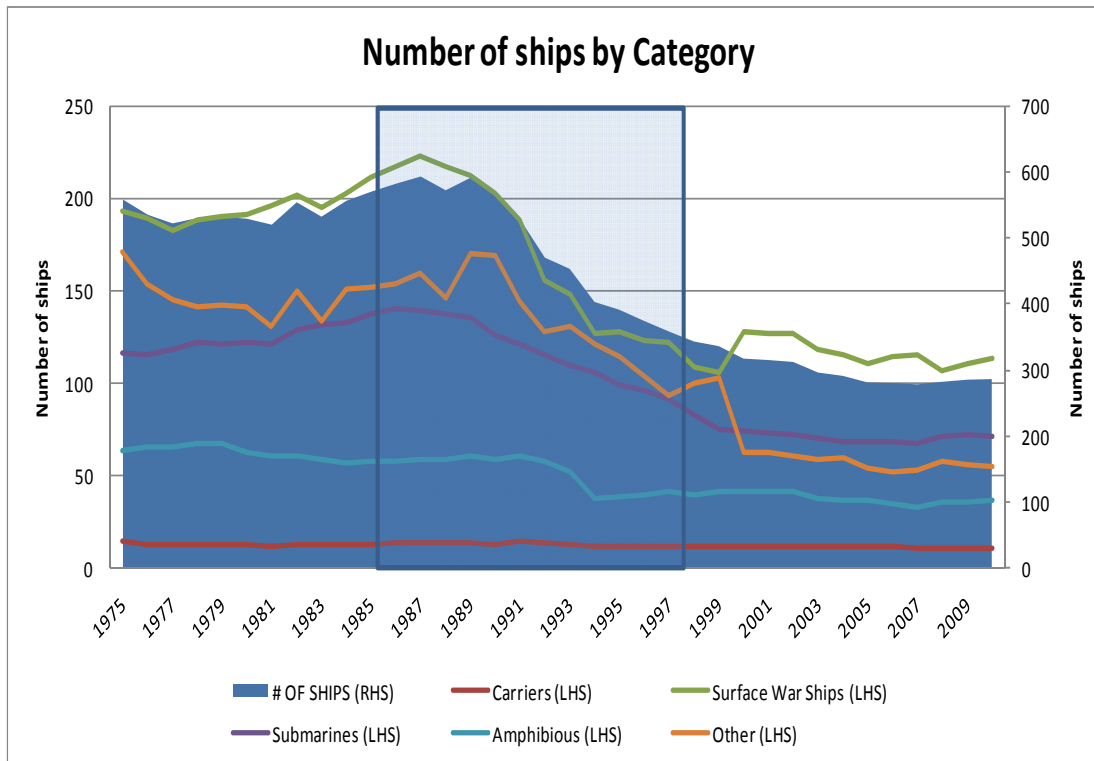


Figure 12. Number of Ships by Category (From Naval Historical Center, 2010)

Actual Number of DoN Ships				
	1975	1985	1998	2010
<b>Carriers</b>	15	13	12	11
<b>Surface Warships</b>	193	211	109	113
<b>Submarines</b>	116	137	83	71
<b>Amphibious</b>	64	58	40	37
<b>Other</b>	171	152	100	55
<b>Total # of Ships</b>	559	571	344	287

Table 9. Actual Number of Ships Per Category

Figure 13 displays the change in the total number of naval ships by category across all three periods (1975–1985, 1985–1998, and 1998–2010). Table 10 is a breakdown of real percentage changes gained or lost in the individual categories over the three identified periods.

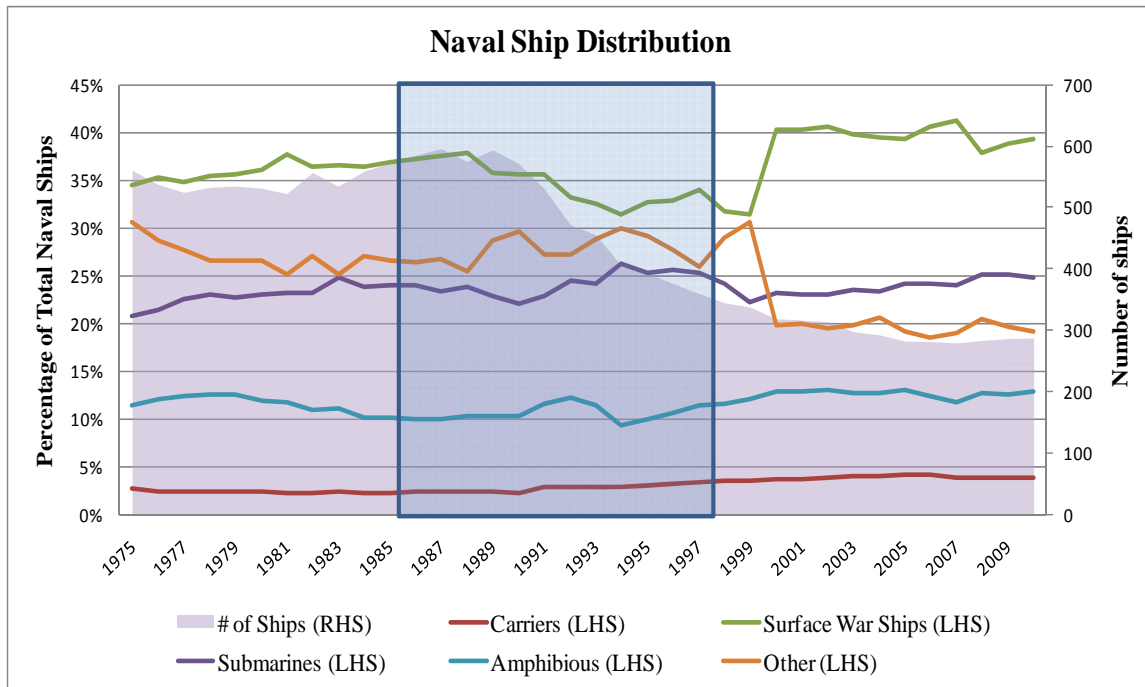


Figure 13. Naval Ship Distribution (From Naval Historical Center, 2010)

Real Growth in Number of Ships by Category and SCN								
1975-1985		Increase/Decrease	1985-1998		All Decreased	1998-2010		Increase/Decrease
Carriers	-13.3%	-2	Carriers	-7.7%	-1	Carriers	-8.3%	-1
Surface War Ships	9.3%	18	Surface War Ships	-48.3%	-102	Surface War Ships	3.7%	4
Submarines	18.1%	21	Submarines	-39.4%	-54	Submarines	-14.5%	-12
Amphibious	-9.4%	-6	Amphibious	-31.0%	-18	Amphibious	-7.5%	-3
Other	-11.1%	-19	Other	-34.2%	-52	Other	-8.0%	-8
SCN (in millions)	95.5%	\$9,132	SCN (in millions)	-49.5%	-\$9,257	SCN (in millions)	42.0%	\$3,965

Table 10. Real Growth in # of Ships by Category and SCN (From Federal Budget 1975–2010, Naval Historical Center)

The allocation of ships changes across all three periods. During the first period, the increase in warships and submarines stands out. During the Cold War, it was important to have an increase in the two categories that were the most necessary to counter Soviet sea power. There was direct relationship to SCN. The second period saw a draw down throughout all categories of ships in response to the end of the Cold War.

The third period is different in that SCN showed a 42% growth, while ships in 4 out of the 5 categories decreased in numbers. There was a spike in surface warships in 2000, and there was a reclassification to include active commissioned ships, those in the Naval Reserve Force (NRF), and ships operated by the Military Sealift Command (MSC). Two different criteria are responsible for the decrease in total number of ships. First, the state of the world at that time was changing. To be more specific, the United States dominated the sea, and the mindset moved to ground warfare. Therefore, there was a reduction in number of ships needed. Secondly, there was a significant increase in technology aboard ships. The increase in technology gave each ship an increased capability, and this meant that it took fewer ships to do the same jobs or complete the same missions than it did before.

As stated earlier, the numbers of surface warships has increased, while the numbers of other ships, including the tankers and supply ships that support the warships continue to decline. If this trend continues, the long-term implications are that the Navy will need fewer supportive ships, and the total number of ships will continue to fall. The consistency of the distribution of naval ships indicates that regardless of the total number of ships, distribution will remain the same.

## **B. STRUCTURE OF DoN AIRCRAFT**

Another way to measure the capability of the DoN is to count the number and different type/model/series (T/M/S) of aircraft. Over time, one would expect the distribution of the aircraft T/M/S of the DoN to vary in response to technological advances, the overall amount of the DoN budget, and its allocation of APN B/A. Does the total number of aircraft move in response to DoN budgets and APN, or does it move based on advancements in technology? In addition, have such factors affected the structure of the naval air service consistently in each of the three periods under study? This section analyzes the DoN B/A, its APN B/A allocation, and its relationship to the total number of Naval Aircraft.

### 1. Analysis of DoN B/A, APN and Total # of Naval A/C (1975–2010)

Figure 14 displays the change in total DoN B/A, Aircraft Procurement, Navy (APN), and the total number of Navy aircraft from 1975–2010.

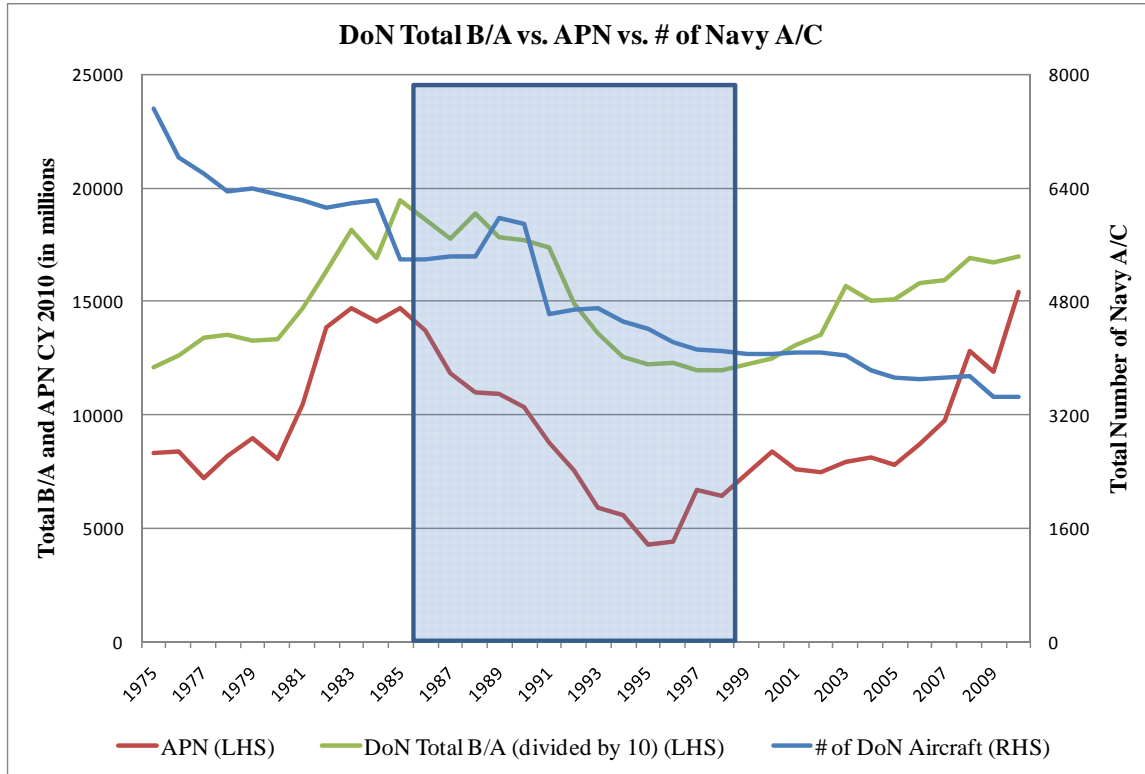


Figure 14. DoN B/A vs. APN vs. # of A/C

It is apparent that the total number of aircraft in the DoN does not follow along with the top line budget for the Navy or its APN B/A. If it did, one would expect to see the line trend upward on the two sides and trend downward in the middle. Figure 14 shows that the total number of aircraft continually declines through all three periods from 7526 to 3848 aircraft. Both The DoN B/A and APN act in a typical fashion and increase during both periods of growth. During the intervening period of decline, all three decreased. There was a spike in the number of aircraft in 1989 and 1990, but the steady fall continued through the third period, despite an increase in both DoN B/A and APN of 139.5% from 1998–2010. During this period of growth, the total number of Navy aircraft decreased from 4100 to 3848, which is a 6% decline.

As stated earlier, measuring the ability of a military unit, such as an air wing, to accomplish its assigned mission is the definition of readiness. Advancements in technology and aircraft design have decreased the need for a large number of aircraft to complete the Navy's mission requirements. The increase in aircraft capabilities to perform and complete missions has also contributed to the decrease in A/C since 1975. Increasing capabilities is never cheap. The cost of aircraft is ever increasing, and it has led the DoN, as well as the DoD, to reevaluate some of the programs that are currently being considered or already underway. The eventual cost of these aircraft programs and the number of aircraft can have a significant effect on the Navy's ability to maintain and expand its forces.

## **2. Analysis of Naval Aircraft Distribution (1975–2010)**

Figure 15 displays the total number and distribution of naval aircraft by category across all three periods (1975–1985, 1985–1998, and 1998–2010). Table 11 and 12 are a breakdown of both the actual number of A/C at certain points in time and the real percentage changes gained or lost in the individual categories over the three periods.

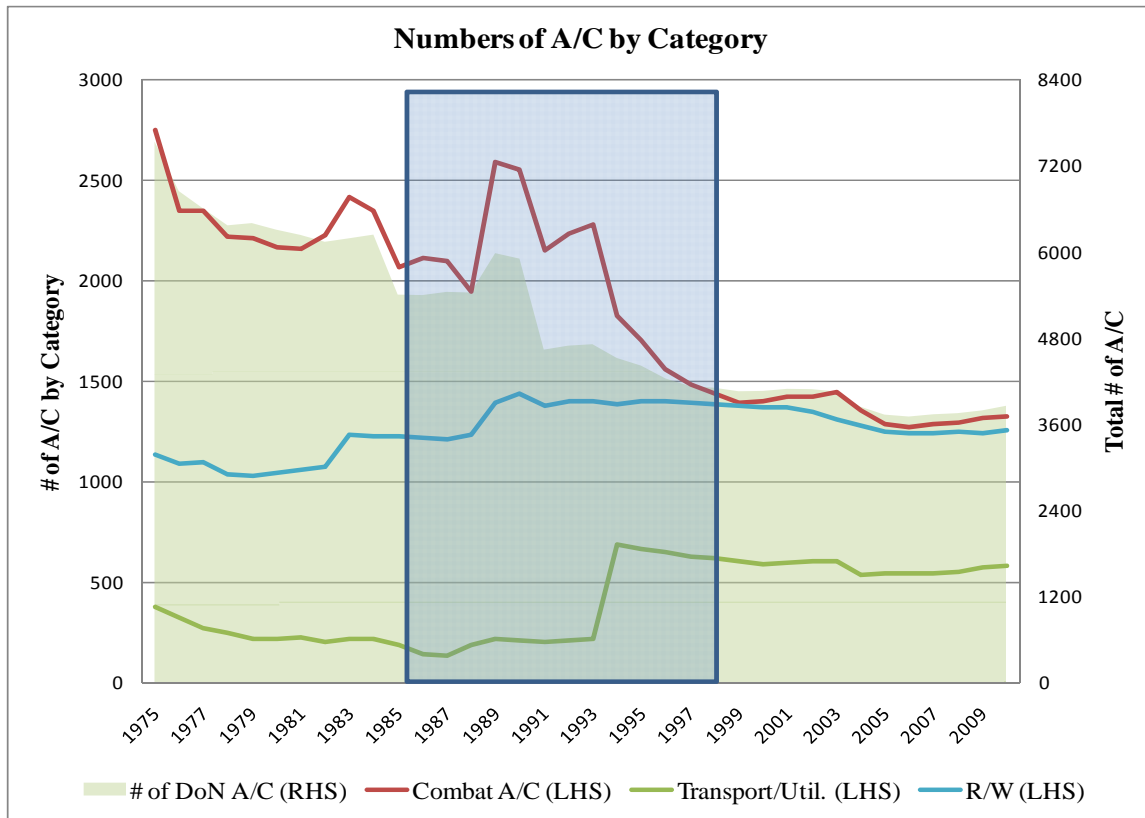


Figure 15. Number of A/C by Category

Actual Number of DoN Ships				
	1975	1985	1998	2010
<b>Combat A/C</b>	2747	2067	1437	1320
<b>Transport/Utility</b>	377	183	615	577
<b>Observation</b>	52	73	23	4
<b>Rotary Wing</b>	1134	1224	1384	1254
<b>Other (Training/Miscellaneous)</b>	3216	1849	641	693
<b>Total # of A/C</b>	7526	5396	4100	3848

Table 11. Actual Number of A/C Per Category

<b>Real Change in Distribution of DoN A/C over the 3 time periods</b>			
	<b>1975 - 1985</b>	<b>1985 - 1998</b>	<b>1998 - 2010</b>
<b>Combat A/C</b>	-24.8%	-30.5%	-8.1%
<b>Transport/Utility</b>	-51.5%	236.1%	-6.2%
<b>Observation</b>	40.4%	-68.5%	-82.6%
<b>Rotary Wing</b>	7.9%	13.1%	-9.4%
<b>Other (Training/Miscellaneous)</b>	-42.5%	-65.3%	8.1%
<b>Aircraft Procurement Navy (APN)</b>	76.7%	-56.2%	139.5%

Table 12. Real Growth in # of A/C by Category and APN

The distribution of Navy aircraft categories changes across all three periods. During the first period of the growth, the percentage for each category is flat with only a slight increase in rotary wing aircraft. This does not match the downward slope of the total number of aircraft or follow the 76% increase in Aircraft Procurement (APN) funds. The second period shows some movement that is counter to both the DoN Total B/A and APN. APN declined by 56% during this period, even as combat aircraft spiked from 1987–1993, transport and utility aircraft increased by 236%, and rotary wing a/c increased by 13.1%. The one period that stands out is the third period of growth, 1998–2010. As the total number of ships in all categories was shrinking, the DoN Aircraft procurement actually increased 139%, from 6.5 billion to 15.4 billion. The distribution of naval aircraft within the total number of DoN Aircraft across all three periods is very consistent. Although there was a decline across the board for the four major categories of A/C, the distribution of different aircraft remains flat.

During the third period, even as the DoN participates in a time of war, the number of aircraft continues to decrease. However, both the DoN Total B/A and APN are rising at a rapid rate. If this trend continues, the long-term implications are that the Navy will continue to develop aircraft with increased capabilities, will need fewer aircraft, and the total numbers will continue to fall. The consistency of the distribution of A/C indicates that regardless of the total number of aircraft in the USN, the distribution will remain the same.

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## **VII. CONCLUSION AND RECOMMENDATIONS**

This purpose of this study was to look at these periods of growth and decline with respect to DoN funding allocations and force structure. This thesis attempts to answer two primary questions. First, what insights can a comparative analysis of two periods of sustained budget growth and an interceding period of budget decline for the DoN provide? Second, what were the changes in the DoN's budget allocations, and what were their effects on force structure? Dividing the DoN's budget into three time-periods provides deeper insight into relationships and changes during periods of sustained budget growth and decline.

### **A. COMPARATIVE ANALYSIS OF PERIODS OF SUSTAINED GROWTH AND DECLINE**

During the first period of budget growth (1975–1985), the relationship between DoN's budget authority and force-structure was relatively consistent; as the DoN's top line increased, so did each appropriation and each facet of the DoN's force structure, with the exception of aircraft.

The DoN's total budget authority during the period 1975–1985 increased from \$120 billion to \$194 billion (or by 62%). The amount of budget authority allocated to MILPERS, O&M and RDT&E all rose at the same time as total DoN B/A, but at a lesser rate, 37%, 44%, and 48%. The amount allocated to Procurement rose by 83% and peaked in 1983 at \$64 billion, which is much faster than the DoN top line. In 1982 Procurement became the appropriation with the highest B/A and remained elevated throughout the rest of the period, which is not unexpected considering the United States was looking to rebuild its force structure by appropriating more funds for investment. What is noticeable is that this period was marked by investment and increase in force structure, with Procurement and RDT&E having the greatest rate of change. When analyzing investment accounts during this period, it is notable that RDT&E grew at a slower rate than Procurement.

Between 1985 and 1998, the DoN's total budget authority decreased from \$194 billion to \$119 billion (or by 38.6%). The amount allocated to MILPERS and O&M both declined at the same time as total DoN B/A, but at a lesser rate 24% and 33% respectively versus 38.6% by total DoN B/A. In 1989, MILPERS became the appropriation with the highest B/A and remained the highest throughout the period. The amount allocated to Procurement and RDT&E declined by 59% and 39% respectively, this is faster the DoN top line. Total DoN B/A and force structure both move inversely to the first period, with the exception of aircraft which remain constant across both periods. During the second period as total DoN B/A and appropriation decrease so does the DoN's force structure; the Navy used fewer ships, aircraft, and personnel. This period of budget decline bridges the gap between the two periods of sustained growth and the most recent periods of sustained U.S. military wartime deployments: the Vietnam War and the Global War on Terrorism.

During the second period of budget growth (1998–2010), the relationship between DoN's budget authority and force structure is remarkably different from that observed in 1975–1985. As the DoN's top line increased, along with each appropriation, each facet of the DoN's force structure declined. Between 1998 and 2010, the DoN's total budget authority increased from \$119 billion to \$169 billion (or by 42%). The amount allocated to MILPERS rose at the same time as total DoN B/A, but at a lesser rate (20% vs. 42%). The amount allocated to O&M also rose at a lesser rate during this period (32% vs. 42%) despite O&M having the appropriation with the greatest amount of budget authority in 1999. The O&M account remained elevated throughout the period, which is not surprising considering the cost associated with supporting the Navy's expensive technologically advanced equipment, and the ongoing operations in Iraq and Afghanistan. In the first period of budget growth (1975–1985), Procurement received the most budget authority, followed by O&M and MILPERS. In this period of budget growth, O&M received the highest level of budget authority followed by MILPERS and Procurement. The amount of B/A allocated to both Procurement and RDT&E rose at much faster rates than the total DoN B/A, 91% and 105%, respectively.

Across all three periods, when the DoN's total budget authority increases all appropriations tend to peak along with the DoN top line. The one exception was the amount of funding allocated to Procurement, which attains its maximum and minimum two years prior to the high and low points of DoN B/A top line. Procurement is the only appropriation whose allocation increases and decreases at a rate faster than total DoN B/A across all three periods. This may indicate that Procurement is more volatile than the other appropriations. During the first period of budget growth, the DoN had a slower growth in Procurement and RDT&E but an increase in force structure. During this period Procurement peaks in 1983 and RDT&E lags two years later and peaks at the end of the period, 1985. However, during the second period of growth Procurement and RDT&E had a much faster rate of growth but force structure decreased. During this period, Procurement lags one year behind RDT&E peaking in 2008, while RDT&E peaks in 2007. This likely indicates that because of information technology advances, the DoN is allocating more and more of its funds into the testing and development phases of the acquisition process, which prolongs the production and procurement of equipment such as ships and aircraft. Overall, when decision makers are looking to allocate funds in the DoN's B/A, historical data shows that Procurement and RDT&E have been to the accounts to experience the most dramatic increases and decreases. MILPERS and O&M accounts, according to historical data, tend to be relatively less affected by changes to the top line.

As SCN and APN are the means of funding for the Navy's ships and aircraft, the total number of ships and aircraft lags behind the increases in those appropriations. The SCN account peaks in 1983 at \$27 billion, while the number of ships finally peaks in 1989 at 592. The time it takes to develop and build ships explains this lag time. The APN account and the total number of aircraft move in opposite directions. The total number of aircraft peaks in 1975, when the APN is at its lowest point of \$8 billion. The number total of aircraft is at its lowest point in 2010 at 3,848 A/C, when the APN peaks at \$19 billion. The peak in aircraft stretches back from early strategic bombing campaigns used in WWII and Vietnam. The DoN purged inventories throughout all three periods due to consolidation of aircraft mission types and aging aircraft. Since then, either the Navy is

performing its mission with fewer aircraft, which may indicate that aircraft are being assigned fewer missions or they are comparatively more capable to complete required missions. Today much of the naval aviation is ship/carrier-based. As the size of the fleet decreases, so does the number of the aircraft.

Throughout the first period of growth (1975–1985), the total number of Navy ships and personnel move with the appropriation accounts in the same direction, which coincides with the top line DoN B/A. The number of aircraft, however, moves in the opposite direction. The pattern changes in the third period (1998–2010), when appropriations increase without a corresponding increase in the number of ships and personnel. The number of aircraft, however, continues to decline during this period. Cost growth is another factor contributing to fielding fewer ships and aircraft. The average cost of a Navy ship has increased from \$1.2 billion in the 1980s to an estimated \$2.7 billion dollars per ship in 2011 in real dollars. During the same period, the number of ships purchased on average each year has declined from 17.2 to 6.0. Like ships, aircraft have steadily increased in cost and capability, which directly reflects the decrease in their numbers over the years. Another factor to take into consideration for the rise in prices of ships and aircraft is that there is a diminished industrial capacity within the U.S. and therefore less competition between private companies to introduce cost effectiveness measures. Over time, the distribution of ship and aircraft types vary in response to technological advances, the overall amount of the DoN budget, and its allocation of procurement funding. This analysis found that during the third period, even as the DoN engaged in a war, its number of ships and aircraft continued to decrease, despite a rising top line. If this trend continues, the long-term implications are that the Navy will continue to develop ships and aircraft with increased capabilities and therefore potentially require fewer numbers.

Throughout the first two periods (1975–1985) and (1985–1998), as the DoN's top line B/A increased and decreased the O&M and MILPERS accounts followed. The total number of civilians and uniformed military personnel follows as well. This pattern changes in the third period (1998–2010) where the appropriations accounts increase without a corresponding increase in the number of uniformed personnel and civilians.

During this period, MILPERS grew by 20% despite a 5% decrease in military personnel. O&M grew by 33% despite a 5% decrease in civilian personnel. MILPERS B/A dollars per person increased at a faster rate than the actual MILPERS account (27% vs. 20%).

Across all three periods, the total number of DoN uniformed personnel increased and decreased by 5%, -28% and -5% respectively. MILPERS increased and decreased by, 37%, -25% and 20% respectively. During the first period of growth, MILPERS increases at a faster rate than total DoN Personnel does. This is inversely different from the second period of growth where as MILPERS increased, despite the total DoN Personnel decreased. The MILPERS B/A dollars per person increased from approximately \$50,000 in 1975 to \$87,000 in 2010. The MILPERS B/A dollars per person increases across all three periods by 31%, 4% and 27% respectively indicating real growth in military personnel wages. Therefore, there is some evidence that because of the increase in MILPERS B/A dollars per person the DoN is paying higher wages to more educated and qualified personnel who are able to perform multiple tasks on highly complex weapons and operating systems. This increase in wages and personnel becoming more educated, along with the benefit and use of cross training, elucidates to the decline in DoN Personnel observed in the second period of growth.

During the first period of sustained growth (1975–1985), the percent of DoN uniformed personnel that were officers rose from 11.5% to 12%. During the second period of growth (1998–2010), it rose from 13.2% to 14.1%. This may be some evidence of “brass creep,” but the phenomenon was primarily limited to the Navy. The more officers the Navy has, the higher the payroll must be.

The relationship between O&M and total DoN Civilians is similar to MILPERS and total DoN uniformed personnel. Across all three periods, the total number of DoN Civilians increased and decreased by, 8%, -41% and -5% respectively. The O&M account increased and decreased by 43%, -33% and 33% respectively. During the first period of growth, O&M increases at a faster rate than total DoN Civilians do. Like MILPERS and uniformed personnel, this is inversely different from the second period of growth where as O&M increased and total DoN Civilians decrease. Of all the personnel in the DoN, civilians comprised 44.6% in 1975, grew modestly to 45.9% in 1985, fell to

37.8% in 1998. There has been no change during this most recent period of budget growth. There has been a steady rise in the payroll for General Schedule (GS) employees, who perform managerial and administrative tasks similar to those done by the officer corps or senior non-commissioned officers, since 1981. In addition, there has been evidence that wage board workers are more prone to outsourcing, and GS workers were more likely to substitute for military personnel, which creates a drop in active duty members. Because of the many factors that make up the O&M account there is not a clear and concise way to determine that this relationship indicates a real growth in civilian wages.

As this study shows, the two periods of budget growth (1975–1985 and 1998–2010) are similar in some respects but vastly different in many other areas. The second period of growth is marked by a 42% increase in B/A, yet the force structure is shrinking. The period of budget decline, 1985–1998, shows a steady decline across all appropriations and force structure that falls in line with the total DoN B/A. Due to rising force structure cost, advancements in technology, staffing, and advancing product development the DoN's future is yet to be told. As the Navy heads into the next decade, the differences in the periods of sustained growth may possibly provide insights into the perceived period of declining DoD and DoN B/A and force structure. The force structure at the end of this period of growth and allocations in the DoN Appropriations accounts may not be able to allow for a similar period of decline to that of (1985–1998). Therefore the responsiveness of the Procurement and RDT&E accounts may not be as evident in the future declining DoD and DoN B/A.

## **B. RECOMMENDATIONS**

Comparing two periods of sustained budget growth and an interceding period of budget decline for the Department of the Navy over the past 35 years is an inherently daunting and detailed task considering the complexity and size of its budget. Future research into this subject should take into account of the following concerns:

Consistency of Data—There have been many policy shifts, not only to accounting styles, but also in the way things (ships, aircraft, submarines, people, appropriation titles, accounts within appropriation titles) are all labeled, tracked, and accounted for within the DoD and the DoN.

Aircraft/Ship Inventory—Changes in Type, Model, Series of aircraft and re-categorizing of ships, makes finding consistent historical inventories challenging.

There are many reasons that link the movement of budget authority to environmental issues such as cost of technology, industrial challenges, and combat operations and personnel concerns. Research to understand these issues and provide concrete evidence to the validity of these causes would be beneficial.

Another area of research is future implications for both the DoD and DoN. What will the next period of decline look like in current trends continue? What if the next period of decline looks like the last period of decline, what will the military force structure look like? Can the data lead to a forecast of next period of decline? More research into what the future budgets or appropriation trends would look like could also prove interesting.

Future theses may want to look into the following questions:

- Are force structure trends consistent throughout the entire DoD infrastructure, specifically, does Department of the Army (DoA) and Department of the Air Force (DoAF) follow the same trends as DoN within those three periods?
- Looking at the DoN Budget authority by appropriation titles, does DoN follow the same trends within DoD budget authority appropriations titles, and, more specifically, do DoA and DoAF follow the same trends within their appropriation titles?
- If the current trends continue, of what can the DoN expect its future budget authority and force structure to consist?

All of these questions and many more with respect to budget authority over the same three periods will provide a better understanding of purchasing power and shifts within the DoD to provide a more capable and better-utilized defense network.

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## APPENDIX. DEFINITIONS

**Appropriation:** Budget authority to incur obligations and to make payments from the Treasury for specified purposes. An appropriation act is the most common means of providing appropriations; however, authorizing and other legislation itself may provide appropriations (Walker, 2005).

**Budget Authority:** Authority provided by federal law to enter into financial obligations that will result in immediate or future outlays involving federal government funds. The basic forms of budget authority include (1) appropriations, (2) borrowing authority, (3) contract authority, and (4) authority to obligate and expend offsetting receipts and collections. Budget authority includes the credit subsidy cost for direct loan and loan guarantee programs, but does not include the underlying authority to insure or guarantee the repayment of indebtedness incurred by another person or government. Budget authority may be classified by its duration (1-year, multiple-year, or no-year), by the timing provided in the legislation (current or permanent), by the manner of determining the amount available (definite or indefinite), or by its availability for new obligations (Walker, 2005).

**Consumer Price Index:** A measure of the average change over time in the prices paid by urban consumers for a market basket of consumer goods and services commonly referred to as “inflation.” Measures for two population groups are currently published, CPI-U and CPI-W. CPI-U is based on a market basket determined by expenditure patterns of all urban households, while the market basket for CPI-W is determined by expenditure patterns of only urban wage earner and clerical-worker families. The urban wage earner and clerical-worker population consists of clerical workers, sales workers, craft workers, operatives, service workers, and laborers. The Bureau of Labor Statistics publishes both indexes monthly. The CPI is used to adjust for inflation, the income payments of Social Security beneficiaries, and payments made by other programs. In addition, the CPI is used to adjust certain amounts defined by the tax code, such as personal exemptions and the tax brackets (Walker, 2005).

**Current Dollars:** “In current dollars” means valued in the prices of the current year. The current dollar value of a good or service is its value in terms of prices current at the time the good or service is acquired or sold (Walker, 2005).

**Deficit:** The amount by which the governments’ spending exceeds its revenues for a given period, usually a fiscal year (opposite of surplus) (Walker, 2005).

**Deflator:** An index used to adjust a current dollar amount to its real dollar counterpart, that is, to remove the effects of inflation. (Walker, 2005)

**Expense Accounts:** For the purposes of this research paper expense accounts will consist of adding MILPERS and O&M money together to define an expense to the DOD and the federal budget.

**Full Time Equivalent:** Reflects the total number of regular straight-time hours (i.e., not including overtime or holiday hours) worked by employees divided by the number of compensable hours applicable to each fiscal year. Annual leave, sick leave, and compensatory time off and other approved leave categories are considered to be “hours worked” for purposes of defining FTE employment (Walker, 2005).

**Gross Domestic Product:** The value of all final goods and services produced within the borders of a country such as the United States in a given period, whether produced by residents or nonresidents. The components of GDP are personal consumption expenditures, gross private domestic investment, net exports of goods and services, and government consumption expenditures and gross investment. That value is conceptually equal to the sum of incomes generated within the borders of the country in the same time period (Walker, 2005).

**Inflation Adjusted Dollars:** A dollar value adjusted to remove the effects of inflation by dividing the nominal value (also called the current dollar value) by the appropriate price index. The resulting amount can be labeled real or inflation adjusted. Real dollar values can reflect a measure of purchasing power, such as real income, or a measure of quantity, such as real GDP. Real dollar is frequently called constant dollar when referring to measures of purchasing power (Walker, 2005).

**Investment Account:** For the purpose of this research paper, investment accounts will consist of adding RDT&E, Procurement and MILCON money together to define an investment to the DOD and the federal budget.

**Outlay:** The issuance of checks, disbursement of cash, or electronic transfer of funds made to liquidate a federal obligation. Outlays also occur when interest on the Treasury debt held by the public accrues and when the government issues bonds, notes, debentures, monetary credits, or other cash-equivalent instruments in order to liquidate obligations. Also, under credit reform, the credit subsidy cost is recorded as an outlay when a direct or guaranteed loan is disbursed. An outlay is not recorded for repayment of debt principal, disbursements to the public by federal credit programs for direct loan obligations and loan guarantee commitments made in fiscal year 1992 or later, disbursements from deposit funds, and refunds of receipts that result from overpayments (Walker, 2005).

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